

73 Amateur Radio Today

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THE NEW! 73 Amateur Radio Today

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COVER: House and antenna of Romeo HJ3BRR, Santiago, Dominican Republic. Photo by SMØJHF.

QRX . . .

Dollar Power

Take out a one-dollar bill and look at it. The one-dollar bill you have first came off the presses in 1957 in its present design.

This so-called "paper" money is in fact a cotton and linen blend, with red and blue minute silk fibers running through it. It is actually material. We've all washed it without it falling apart. A special blend of ink is used, the contents we will never know. It is overprinted with symbols and then it is starched to make it water resistant and pressed to give it that nice crisp look.

If you look on the front of the bill, you will see the United States Treasury Seal. On the top you will see the scales for a balanced budget, and for fairness. In the center you have a carpenter's square, a tool used for an even cut. Underneath is the key to the United States Treasury. That's all pretty easy to figure out, but what is on the back of that dollar bill is something we should all know.

Turn the bill over and you will see two circles. Both circles together comprise the Great Seal of the United States. The First Continental Congress requested that

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X Again

Has my tolling the Planet X bell of coming doom got you worried yet? If you've been able to whistle yourself past this potential graveyard then one of the last things you'll want to do is read James McCanney's *Planet-X, Comets & Earth Changes*.

This \$18 book, ISBN 0-9722186-0-2, is self-published. See [www.jmccanneyscience.com]. It's a chronicle of Jim's 22-year fight, mostly with NASA, for recognition of his theory that comets are not dirty snowballs, and that comets have had and still are having a profound influence on Earth.

Using his model he's been able to accurately predict hurricanes, tornadoes, and typhoons. His model also explains how and why Planet X, though still far out in our solar system, has already had a profound influence on the Sun, extending the sunspot maximum beyond all previously recorded cycles. He's predicting that as Planet X gets closer, we'll be seeing devastating weather on Earth, with the risk of repeating what's happened with past extinction events.

So why haven't we been hearing anything about all this in the news? It turns out that all NASA scientists are restricted by an NSA decree to not discuss or admit publicly to any event or situation that might cause public alarm. Data about the arrival of Planet X is not being allowed to be released.

And, just to make sure the

lid is on tight, NASA has Congress muzzled. Senators and representatives know that if they cause NASA any problems, their district will be cut from any further government funding of projects.

NASA = Never A Straight Answer, and National Astronomy Security Agency.

Jim says that our mountain ranges, coal, and oil deposits were all formed in a matter of hours as the result of passing comets or past Planet X visits — and that they don't even have to pass very close to cause severe effects.

This helps explain the recent discovery of a city 2,500 feet under the Caribbean, near Cuba. And the sudden disappearance of Atlantis, and its colonies all around the world around 10,000 years ago, which would be three passes ago for Planet X.

As Alfred E. Neuman says, "What, me worry?"

We Did, Too!

NASA made worldwide news (my thanks to LA4YE for an Oslo newspaper clipping) by funding the writing of a book debunking the crazies who have been questioning the reality of those astronaut Moon visits thirty years ago. The writer sure has his work cut out for him.

Why am I reminded of the famed Condon Report which debunked the presence of UFOs? It didn't help Condon's credibility when his assistant fessed up later that Condon got the project with the proviso that he was not to find any credible evidence for UFOs being real.

NEVER SAY DIE

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I hope the new book will explain the footprints and tire tracks in the dust on the Moon. Since it requires some sort of atmosphere for there to be any dust, a fact which can be substantiated in any lab with a bell jar and a vacuum pump, how did they make those famed Moon boot footprints? Plus 44 other damned good reasons to be convinced the Apollo trips were hoaxes.

Weird

Hillary gets \$8 million for her memoirs. Bill gets about \$12 million for his as-yet-unwritten memoirs. This from two people who spent eight years being unable to recall, while under oath, anything about past events.

Roger

Roger on the rig there. Roger on the antenna. Roger on the weather. Thanks for the nice QSO. 73.

The Hobby Growth

The latest FCC figures show that the number of licensees has grown by about 1,800 over the last two years. (Yeah, see that stuff in "QRX," and then read this.) That's about an eighth of a percent per year. If that isn't bad enough, this figure includes tons of silent mikes. With today's ten year licenses, there are nine years of dead hams still being counted — like the voters in Chicago.

Now let's do a quick calculation and estimate the actual live ham population. With

680,000 licensees on the FCC rolls, with today's average life span being about 75 years, and with the average ham age today at about 63 years, we should see about 28,333 die per year (unless they read 73 and change their diets). That's about 255,000 possible silent mikes over a nine year period that the FCC is still counting as licensees. That would bring the total down to more like 425,000, somewhat lowering that growth figure.

Counting the silent mikes, about a quarter of one percent of Americans (dead and alive) have ham tickets. That's a pretty exclusive club, eh? No wonder we don't get no respect.

Please let me know when you think it's time for some group to start promoting the hobby so we'll see some growth. Oh, and tell me what group you recommend for the job.

Iconoclast

Iconoclast: a person who attacks cherished belief systems or institutions which he thinks are wrong or foolish.

Well, that sure describes me. I'm out here with my little pocket knife attacking 800-pound gorillas such as our public school system-NEA, the AMA-FDA-pharmaceutical industry, the coal-oil-natural gas industries, the power industry, the post office, the farming and food processing industries, colleges and universities, NASA, and a bunch more...like our bribed-to-the-gills Congress.

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continued from page 1

Benjamin Franklin and a group of men come up with a Seal. It took them four years to accomplish this task and another two years to get it approved.

The left-hand circle contains a pyramid. Notice the face is lighted, and the western side is dark. This country was just beginning. We had not begun to explore the West or decided what we could do for western civilization. The pyramid is uncapped, again signifying that we were not even close to being finished. Inside the capstone you have the all-seeing eye, an ancient symbol for divinity. It was Franklin's belief that one man couldn't do it alone, but a group of men, with the help of God, could do anything.

"IN GOD WE TRUST" is on this currency. The Latin above the pyramid, ANNUIT COEPTIS, means "God has favored our undertaking." The Latin below the pyramid, NOVUS ORDO SECLORUM, means "a new order has begun." At the base of the pyramid is the Roman numeral for 1776. If you look at the right-hand circle, and check it carefully, you will learn that it is in every national cemetery in the United States. It is also on the Parade of Flags Walkway at the Bushnell FL National Cemetery, and is the centerpiece of most heroes' monuments. Slightly modified, it is the seal of the President of the United States, and it is always visible whenever he speaks, yet very few people know what the symbols mean.

The Bald Eagle was selected as a symbol for victory for two reasons: First, he is not afraid of a storm; he is strong, and he is smart enough to soar above it. Second, he wears no material crown. We had just broken from the King of England. Also, notice the shield is unsupported. This country can now stand on its own. At the top of that shield there is a white bar signifying Congress, a unifying factor. We were coming together as one nation. In the eagle's beak you will read, "E PLURIBUS UNUM", meaning "one nation from many people."

Above the Eagle, there are thirteen stars, representing the thirteen original colonies, and any clouds of misunderstanding rolling away. Again, we were coming together as one. Notice what the eagle holds in his talons. He holds an olive branch and arrows. This country wants peace, but we will never be afraid to fight to preserve peace. The Eagle always wants to face the olive branch, but in time of war his gaze turns toward the arrows.

It is said that the number 13 is an unlucky number. This is almost a worldwide belief. A room is seldom numbered 13, and few if any hotels or motels have a 13th floor. But consider: 13 original colonies, 13 signers of the Declaration of Independence, 13 stripes on our flag, 13 steps on the pyramid, 13 letters in the Latin above, 13 letters in "E Pluribus Unum," 13 stars above the eagle, 13 bars on that shield, 13 leaves on the

olive branch, 13 fruits, and if you look closely, 13 arrows. And, for minorities: the 13th Amendment.

Your children don't know this, and their history teachers don't know this. Too many veterans have given up too much to ever let the meaning fade. Many veterans remember coming home to an America that didn't care. Too many veterans never came home at all.

Thanks to Internet author(s) unknown, via The Tuned Circuit, bulletin of the L'Anse Creuse (MI) Amateur Radio Club, October 2002.

Barcodes Can Save Lives

You know those barcodes that grocery workers scan to let you know how much your cereal costs? Well, hospitals are now using the same technology to help save lives, thanks to a computerized medication system. A nurse scans the barcode on a patient's I-D bracelet, along with a barcode found on the medication itself, before administering the drug. This enables the computer to verify and check the barcodes to make sure the patient is getting the correct medication. A green signal tells the nurse it's okay to proceed. An error warning, and red signal, alerts the nurse if something is not right.

To date, only about two percent of the nation's medical facilities use barcode technology to verify medication administration, but that number is expected to rise. Statistics show that the system prevents anywhere from 84 to 264 potential errors a week at one hospital alone.

Thanks to Science Today, via Newsline, Bill Pasternak WA6ITF, editor.

FCC Honors World War II Comanche Code Talkers

The Comanche Code Talkers were members of a specialized communications unit of the U.S. Army 4th Signal Corps. Using their ancestral Comanche language, they created an unbreakable code used by Allied Forces in World War II. Now, decades later, our own Federal Communications Commission has paused to honor this group of Native Americans for their meritorious service to our nation.

Charles Chibitty of Tulsa, Oklahoma, was the FCC's guest of honor at the recent ceremony. He told how he and 16 other young men, who had grown up together and were all members of the Comanche Tribe of Oklahoma, used the Comanche language and their Army communications skills to create a military intelligence code that was never broken by the enemy.

Even more interesting, Chibitty also shared anecdotes from their enlistment and training. He explained that they even had to create Comanche code words for "bomber" and "tank." These are words that did not exist in the Comanche language.

Chibitty is a decorated veteran and the last surviving member of the 16 Comanche Code Talkers. You can read more at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-228074A1.doc]. Thanks to CGC Communicator and the FCC, via Norm Seeley K17UP in Newsline, Bill Pasternak WA6ITF, editor.

The War on Terror: a Banner and a Link

Pieter Wycoff KG4UPX says over the Internet that he has found an important tool that every concerned ham should have on his or her personal Web site. Wycoff says that the Homeland Security Knowledge Database has a banner that can be posted to any web site notifying visitors of the current color status of alert to terrorist threats.

The site also contains lots of other information relevant to homeland security and how you can play a part. You can even sign up to receive threat notification updates by E-mail. To learn more on how you can add this feature to your ham radio Web site, take your Web browser to [<http://www.twotigersonline.com/resources.html>].

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

How Slow?

Thirteen (yes, 13) reasons why the English language is so hard to learn:

1. The bandage was wound around the wound.
2. The farm has land and was used to produce produce.
3. What dump was so full that it had to refuse more refuse?
4. We must polish the Polish furniture.
5. He could lead if he would get the lead out.
6. The soldier decided to desert his dessert in the desert.
7. Since there is no time like the present, they're ready to present their present.
8. A bass was painted on the head of the bass drum.
9. When shot at, the dove dove into the bushes.
10. I did not object to the object.

Thanks to The Tuned Circuit, bulletin of the L'Anse Creuse (MI) Amateur Radio Club, October 2002.

Be Careful What You Say On the Air

Use discretion on the air, and help defeat the terrorists. That's the sub title of Bill Sexton's MARS column that appeared in the December issue of *Worldradio Magazine*. And in it, Sexton, who holds the call N1IN, says that Americans

now face a new concern over the indiscreet transmission of material that may seem harmless but which could be used against us by a terrorist enemy.

By way of example, Sexton cites the well-published airline schedules that were used by al-Qaeda terrorists to coordinate their September 11th attacks on New York and Washington. This is material still available on every airline's Web site.

Sexton says that we all must be concerned with what the military calls Operational Security or OPSEC. And he indicates that it is very important for hams to consider what they are saying on the air, because you can never tell who is listening in. And he says that even the most seemingly innocuous tidbits of information, monitored by hostile ears, are probably being handed on to the enemy's intelligence analysts in the hope that it will reveal some weakness or secret that can be used against us.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Good Numbers in the USA

Last year at this time, there were nearly 683,000 hams licensed by the FCC. As of October last year, there were 2,235 fewer — but numbers are not always what they seem. The reality is that ham radio in the United States is growing once again.

First, the General and Extra classes have increased substantially since the 13- and 20-word-per-minute Morse code exams were eliminated on April 15th of 2000. In fact, the number of people holding these licenses has increased by well over 25,000 for each license class. And that's great news for ham radio equipment suppliers, since they rely on higher dollar high frequency transceiver sales for much of their yearly income.

The Technician class is holding its own, too. The number of new Tech license holders is keeping pace with the number of hams either upgrading or dropping out of amateur radio. The net change is close to zero.

Only the Novice and Advanced classes are seeing significant drops in numbers. No new Novice or Advanced class tickets have been issued since April, 2000. And while existing licenses can be modified and renewed, it appears as if that's just not happening among Novices. They appear to be fading away, and quickly — there were 65,000 Novices in 1997, but now there are only about 37,000.

The bottom line is that for the last 12 months ham radio has seen an average of 1,600 brand new ham licenses issued each month. That's an improvement of 160 a month over the previous year. And that improvement is very good news for ham radio.

As to the state with the largest number of hams? It's still California, which can now claim being home to more than one seventh of all the nation's hams. Latest figures show there are more than 100,000 hams now living there.

The state with the fewest hams? North Dakota with only 1,575.

The bottom line is this: Restructuring seems to be doing the job it was intended to do. It's now up to those in the hobby to work to swell its ranks even more.

Thanks to W5YI via David Black KB4KCH in Newsline, Bill Pasternak WA6ITF, editor.

Radio Redux

A self-organizing electronic circuit has stunned engineers by turning itself into a radio receiver. What should have been an oscillator became a radio.

This accidental reinvention of the radio followed an experiment to see if an automated design process that uses an evolutionary computer program could be used to "breed" an electronic circuit called an oscillator. An oscillator produces a repetitive electronic signal, usually in the form of a sine wave.

Paul Layzell and Jon Bird at the University of Sussex in Brighton applied the program to a simple arrangement of transistors and found that an oscillating output did indeed evolve.

Continued on page 58

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LETTERS

From the Ham Shack

Dain Lones KC6WZK, 3332 Palos Verdes Dr. N., Palos Verdes Estates CA 90274. After reading Carl Herbert's article on writing a short story, on page 41 in the August issue of 73, I thought the enclosed might be of interest to some of your readers, even though there are not many "home-brewers" around these days. Maybe this might crank some of them up.

First, a little background might also be of interest. Some 72 years ago while in elementary school, I built my first transmitter, a spark gap unit, with which I spoiled all the neighbors' radio reception, and at which time I also built my first crystal set. A couple of years later, while in junior high school, I built my first tube-type transmitter (a one-tube 201A), as well as a two-tube receiver. High school found me more interested in cars, girls, and sports, and as a result I got away from ham radio for many years.

After retirement 21 years ago, my interest peaked once again. I got my license and started building home-brewed projects. To date I have completed some 440 of same. In so doing, I use segments of many articles in 73, CQ, and QST magazines, and the ARRL handbooks, to build modules which I can choose in building my final projects — none of which are built from kits, including what is shown here.

So there you have a little history on how I got started and learned a lot. I recommend the same to others.

The photo and the following describe my

present all-home-brew station: The bottom unit is my 6-band (3–30 MHz) superheterodyne receiver with a home-brew worm gear as modified for an old General Radio dial providing a 200:1 ratio. On top and at the front of the receiver is my digital readout for the receiver that can be set for any IF value (I use 10.8 MHz). On top and at the rear of the receiver is my QRP, CW, and voice 10-meter transmitter. On top of the transmitter is my roller coil transmatch with cross needle, digital and bar graph, and power/SWR readout (for those who want a choice). On top of the transmatch is my 50W CW, 35W voice linear broadband power amp. The driver is my QRP transmitter. So there you have it, a complete all-home-brew station.

Here's to getting some of the newcomers interested in home-brew!

Arnold Samuels KH6COY, Ocean Shores WA. It is my sad duty to announce the death of my good friend, Joseph "Pop" Bushnell WA7BLE, on Nov. 9, 2002. He was 76 years old.

Joe was in the Army Air Corps during World War II. He served in the Asian/Pacific theater with the 5th Air Force, 22nd Division. He also served in the Germany airlift and flew with the Hurricane Hunters while stationed in Bermuda. He married Diana J. Kilber WA7BLF in 1949.

Joe retired from 21 years of active duty. He earned his bachelor's degree in education.

In 1974, he earned his master's degree in education. He was a leader in the Boy Scouts of America.

Joe was a joiner and very active person around this area. He taught first aid for the Red Cross, and amateur radio in the local North Beach High School. He was a member of the local VFW post. He was also a member of the Ocean Shores Elks Club. He was a member of the Grace Harbor Amateur Radio Club for as long as I have known him (21 years). Joe was a doer all his life and was always willing to help. He will be missed by the radio group of Grace Harbor.

Ray J. Howes G4OWY, Dorset, England. Was it serendipity or what? There I was, moaning about the lack of QRP coverage in 73, and lo and behold, in the October issue, an article courtesy of KF6FJU, interviewing Marshall Emm N1FN — QRP devotee and president of Milestone Technologies, Inc. Well done!

Like KF6FJU, I too fondly remember my first kit build many years ago. However, unlike KF6FJU's first effort, mine ended up a bit like a mini-nuclear explosion. I forgot to reduce the volts input! Silly me. The second attempt worked fine — and still does.

* * *

Just got my November issue of 73 in the daily deluge of mail, and as a fan of QRP, guess which page I turned to first? Yep, page 53! — written of course by the irrepressible Michael Bryce WB8VGE. After my moans about the lack of QRP columns of late, someone at the top must be listening. Keep 'em coming, now!

By the way, been enjoying "The History of Ham Radio" series. I'm a sucker for all things nostalgic — I just can't help myself.

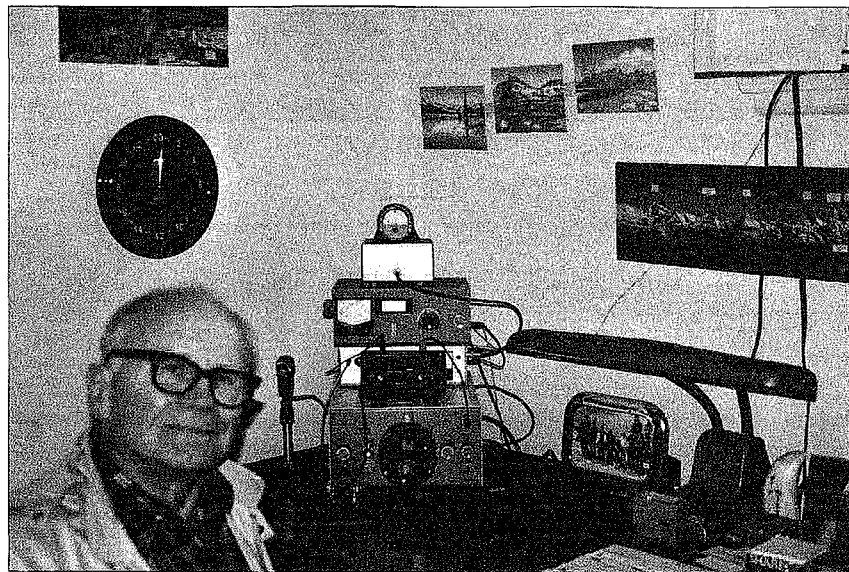


Photo A. KC6WZK's all-home-brew station.

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There are only two types of electrolytic capacitors in your equipment — those that have failed and those that will fail. Only a small percentage of bad electrolytics fail as a short circuit. Rather, most dry out and gradually become less effective at their filtering, coupling, or bypassing job.

Troubleshooting a dried-out electrolytic isn't the easiest task, even if your workshop is equipped with a capacitance bridge. A relatively new test instrument, the equivalent series resistance (ESR) meter, makes this task simple. Although ESR meters are commercially available, it isn't hard to build one. This article takes you through the design and construction of a simple ESR meter.

What is equivalent series resistance, and how do you measure it?

A real capacitor isn't the simple perfect device that the schematic symbol might lead one to believe. Two common capacitor models are shown in **Fig. 1**. We'll be concerned only with the simplified model:

- L represents the inductance of the lead wire and capacitor construction.
- R_s represents all the loss elements of the capacitor, including lead wire loss, capacitor electrode loss and dielectric loss.
- C is an ideal capacitor, with no loss and zero inductance.

As an electrolytic capacitor dries out, R_s increases, while L and C remain relatively constant. Thus, if we can measure R_s , we can detect faulty capacitors. We obviously can't measure R_s with a standard DC ohmmeter: C blocks DC current flow and at most we would measure the leakage resistance R_L in **Fig. 1(a)**.

However, suppose we had an ohmmeter that worked with AC instead of DC. With such a device, we would then measure the composite impedance Z of

the series combination of the reactance of L and C and R_s . If we use a reasonably high frequency, typically 100 kHz, the reactance of L and C will be negligible in comparison with R_s for reasonable capacitance values. We can illustrate this with an example.

Consider a 10 μF nominal aluminum electrolytic capacitor. From measurements, at 100 kHz we know that $C = 12.4 \mu\text{F}$, $R_s = 1.5$ ohms, and $L = 35$ nH (including 1/2-inch leads).

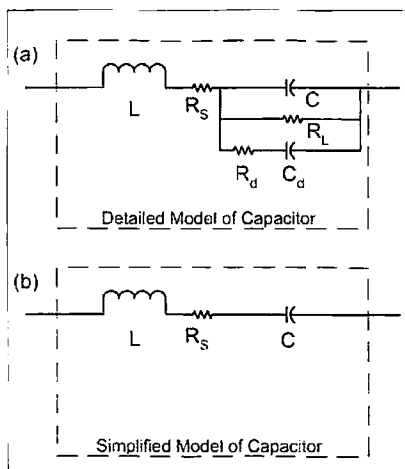


Fig. 1. A real-life capacitor can be modeled differently depending upon the level of detail necessary.

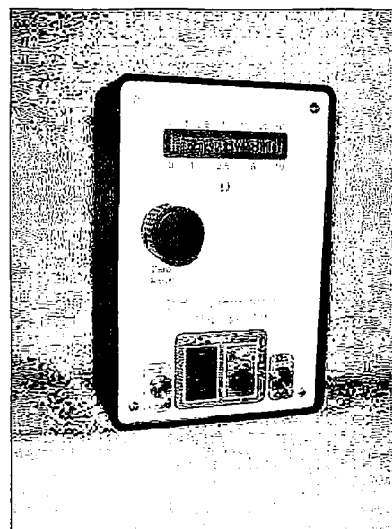


Photo A. Finished ESR meter.

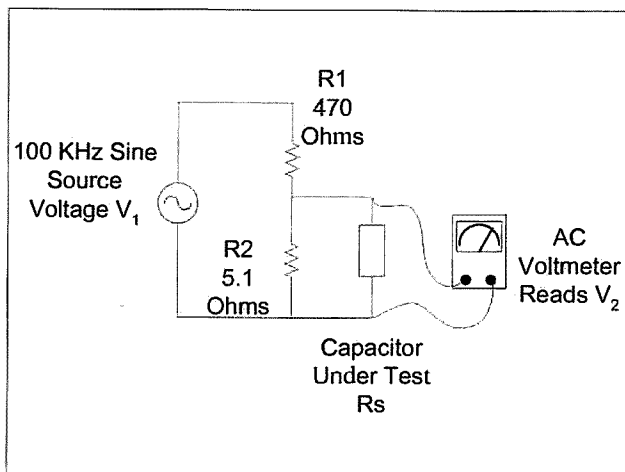


Fig. 2. The principle behind the ESR meter.

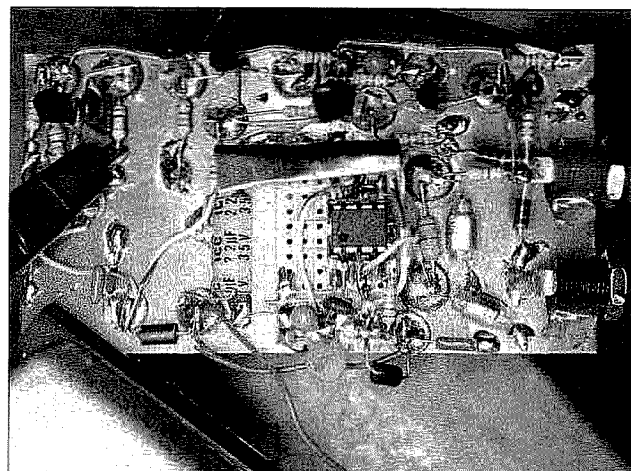


Photo B. I built the prototype using Manhattan-style construction.

We now calculate the reactive components of the model at 100 kHz:

$$X_C = 1/(2\pi FC) = 1/(2\pi \times 100 \times 10^3 \times 12.4 \times 10^{-6}) = 0.128\Omega$$

$$X_L = 2\pi FL = 2\pi FL = 2\pi \times 100 \times 10^3 \times 35 \times 10^{-9} = 0.022\Omega$$

The impedance magnitude of the capacitor is thus

$$|Z| = \sqrt{R_s^2 + (X_L - X_C)^2} = \sqrt{1.5^2 + (0.022 - 0.128)^2} = 1.503\Omega$$

Thus, at a frequency sufficiently high to make X_C small, yet low enough for X_L to also be small, Z is approximately equal to R_s . Fig. 9 shows estimated $|Z|$ over the range 100 Hz to 100 MHz and illustrates that between 10 kHz and 5 MHz, the impedance is dominated by R_s , the Equivalent Series Resistance. (Fig. 9 is only approximate, as it assumes that L , C , and R_s remain constant. In fact, these parameters are all somewhat frequency dependent.)

Our "AC ohmmeter" can be as simple as Fig. 3. If the ESR dominates the impedance of the capacitor under test, a bit of simple algebra shows that the voltage V_2 is proportional to the ESR:

$$ESR = (V_2 R_1 R_2) / V_1 R_2 - V_2 (R_1 + R_2)$$

Fortunately, we won't have to use this equation; rather, we will simply calibrate the voltmeter scale in terms of ESR. The scale won't be linear, of course.

Circuit description

Our ESR meter has three main elements:

- A 100 kHz sine wave source
- An AC voltmeter (calibrated in terms of ohms of ESR)
- An LED bar graph display

U5 is a CMOS version of the popular 555 timer chip. It generates a 100 kHz, 50% duty cycle square wave. The square wave is fed through a low pass filter consisting of L1, C9, and C10. By stripping off the higher harmonics, the low pass filter converts the square wave into a reasonably good sine wave.

The 100 kHz sine wave feeds the voltage divider R16 and R18. The unknown capacitor is connected across R18, a 5.1 ohm resistor. Diodes D2 and D3 protect the instrument from damage, should the capacitor under test have some residual charge.

The maximum (open circuit) voltage applied to the capacitor under test is about 110 millivolts, peak-to-peak. By intentionally limiting the test voltage to such a low value, it is possible to test a questionable capacitor in-circuit, even if a diode or transistor junction shunts it. A silicon PN junction requires about 600 millivolts to

Continued on page 13

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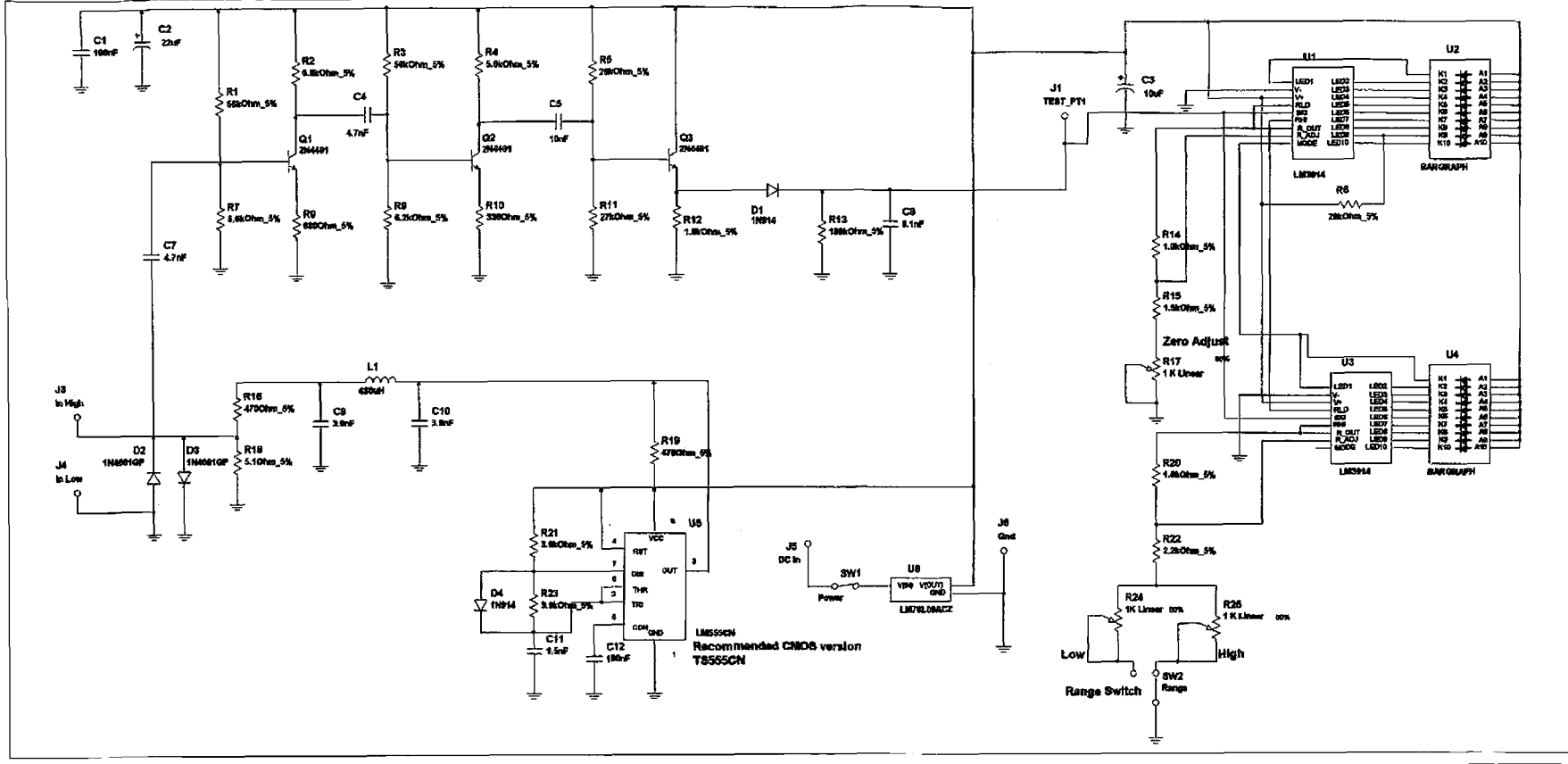


Fig. 3. Schematic diagram of the ESR meter.

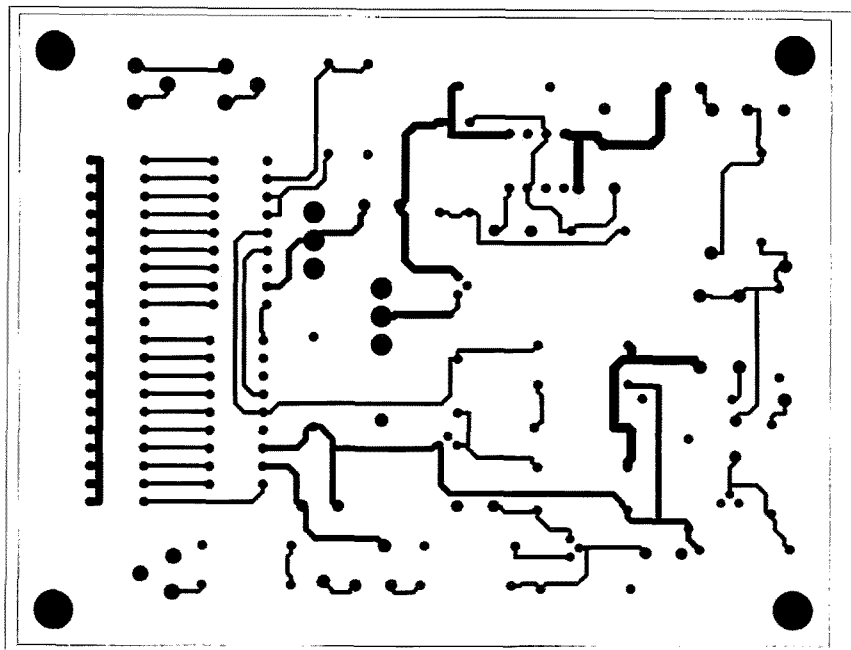


Fig. 4. 100% PC board layout — top copper (top view).

Build This Amazing ESR Meter

continued from page 11

cause significant current flow, so it looks like an open circuit to the test voltage.

Q1 and Q2 are a simple RC-coupled amplifier. The coupling capacitors (C7, C4, and C5) have been chosen to

roll off frequencies below 100 kHz. The emitter resistors (R8 and R10) are intentionally not bypassed to increase stability.

The amplifier output feeds Q3, an emitter follower. D1 is forward-biased by the DC across R12, so D1, R13, and C8 act as a peak detector. The voltage at Test Point 1 ranges from 3.9 volts (short circuit across the input) to 5.5 volts

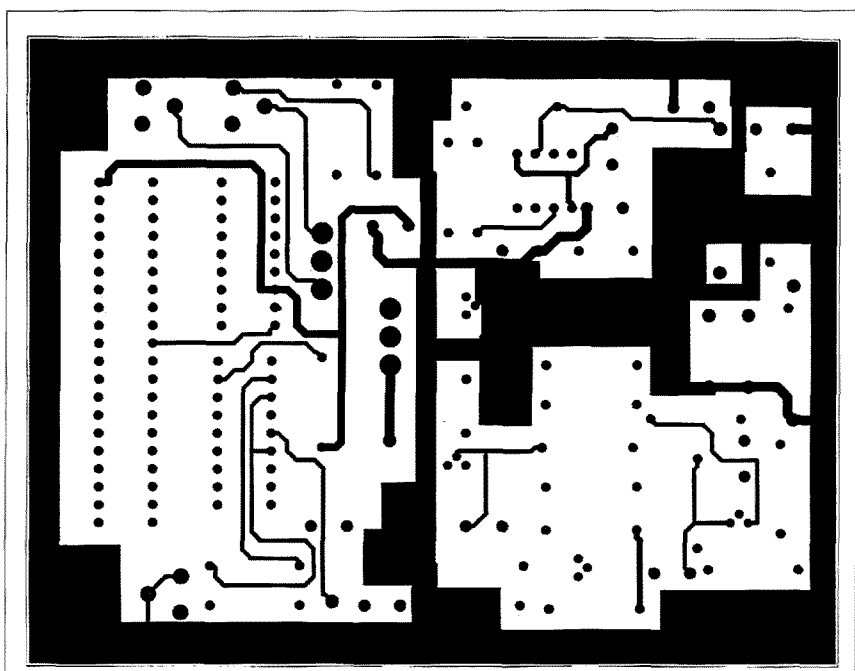
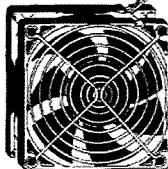


Fig. 5. 100% PC board layout — bottom copper (top view).

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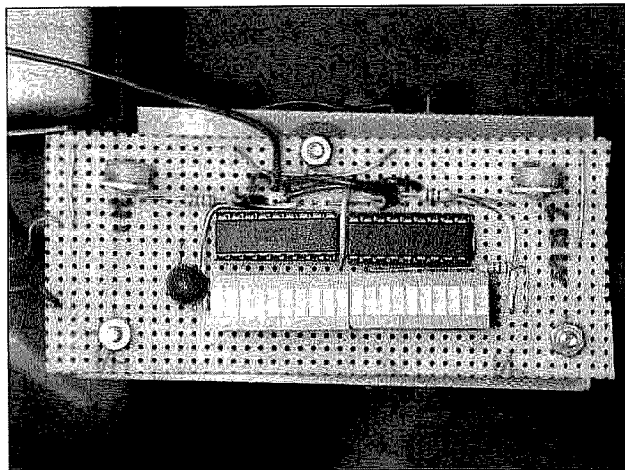


Photo C. The prototype display unit is built on standard perfboard.

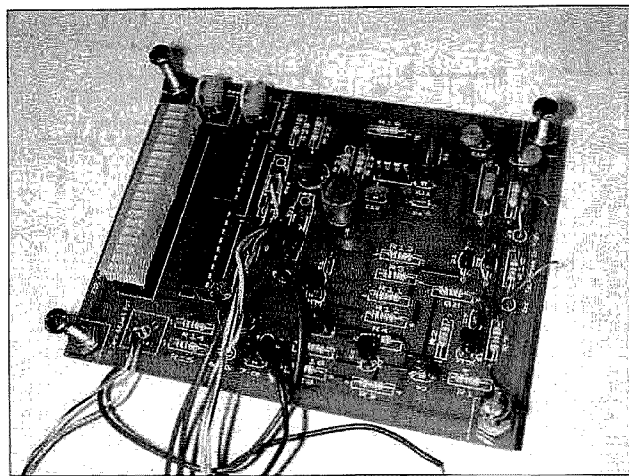


Photo D. The finished design, with a commercially made double-sided PC board.

(50 ohm resistor across the input). This voltage is applied to the signal input of the display section.

U1 through U4 form a moving dot LED bar graph to display the DC output voltage from D1. The circuit is taken directly from National Semiconductor's data sheets for the LM3914 linear bar driver. By cascading two LM3914s (U1 and U3), the voltmeter range is spread over 20 LED segments. U2 and U4 are LED bar graph displays. I used red displays because they are brighter for a given current consumption than other colors.

The LM3914s contain a voltage reference and internal voltage divider. R14, R15, and R17 adjust the voltage applied to the low end of the voltage divider chain. R17 is used to adjust the bar display "zero" setting, corresponding to the voltage output when the test terminals are short-circuited. R14 also functions as an LED display current control and is set for approximately 12.5 mA.

R20, R22, and either R24 and R25 perform the same function for the high end of the voltage divider chain. A switch permits selecting between two

voltage settings. R24 and R25 are adjusted to turn on the 20th LED when a resistor corresponding to full scale (10 ohms or 50 ohms) is connected across the test terminals. R20 also functions as an LED display current control and is set for approximately 12.5 mA.

Power for the circuit is regulated by U6, a low-power 9 volt integrated regulator. DC input power should be in the range 12–14 volts, or up to 18 volts if U6 is equipped with a slip-over heatsink. I've powered the LEDs from the +9 volt regulated bus. If power consumption or regulator power dissipation is a concern, the LED drive current can be provided from a separate source of 4 volts or more.

I've used 5% carbon film resistors throughout the design because the ultimate display only shows 20 resistance steps and using the more expensive 1% metal film components isn't justified. I built two units and found the stated values were satisfactory. It's possible, however, that an accumulation of resistor tolerances might require changing R15 or R22 slightly in order to calibrate the display.

Construction

I built a prototype using Manhattan-style construction, popularized by Wes Hayward W7ZOI. An excellent description of the nuts and bolts of Manhattan-style construction can be found at K7QO's Web page [<http://www.qsl.net/k7qo/>]. The display section used

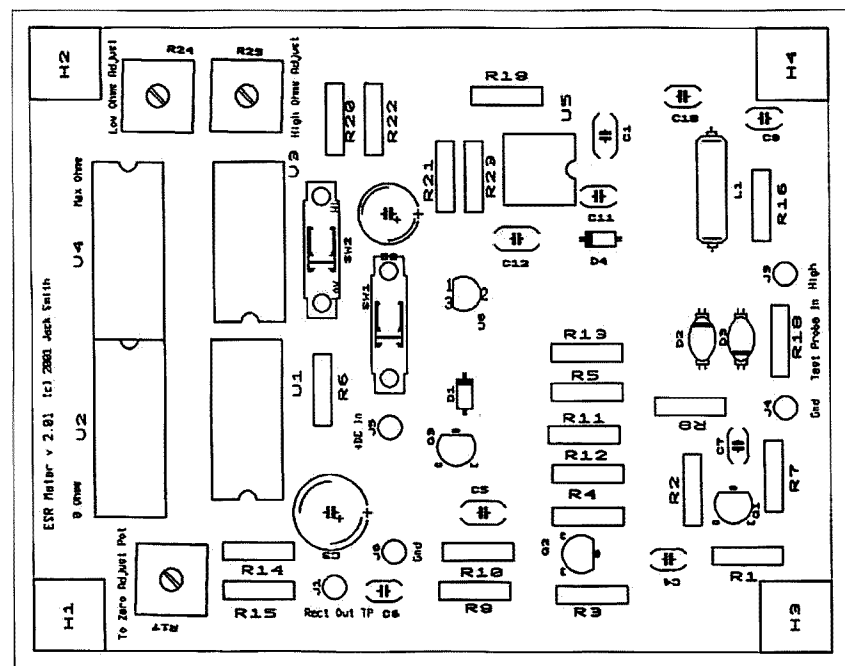


Fig. 6. 100% PC board layout — parts placement (top view).



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conventional perfboard. Manhattan-style construction goes rapidly, and I built the prototype in a couple of hours. So, don't feel that a printed circuit board is necessary.

I also laid out a double-sided printed circuit board and had it fabricated by a prototype board house. I used this professional board for the completed unit.

It's always a good idea to build and debug a project in stages. The ESR meter has three logical stages that you can build and check sequentially:

The 9-volt regulator circuitry, the 555 timer and low pass filter (including R16 and R18). The output of U6 should be between 8.55 and 9.45 volts. At U5 pin 3, you should see a 100 kHz square wave, with a peak-to-peak voltage of about 8 volts. The precise frequency isn't critical, but it should be within 15% of 100 kHz. At the output of the low pass filter (junction of L1 and R16), you should see a clean 100 kHz sine wave with a peak-to-peak amplitude of approximately 10 volts. At the test lead connections (across R18), you should see a 100 kHz sine wave with a peak-to-peak amplitude of about 110 millivolts.

The amplifier and peak detector (Q1, Q2 and Q3 and D1). The following measurements are all peak-to-peak and assume the 100 kHz signal levels in the previous stage are correct. At the base of Q1, you should measure about 105 millivolts; at Q1's collector, 390 millivolts. At Q2's collector and at Q3's emitter, 3.8 volts. All should be clean 100 kHz sine wave signals. Check the DC voltage at the junction of D1, R13, and C6. With the input terminals open-circuited, you should measure about 5.5 volts. With the input terminals short-circuited, this

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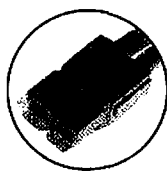
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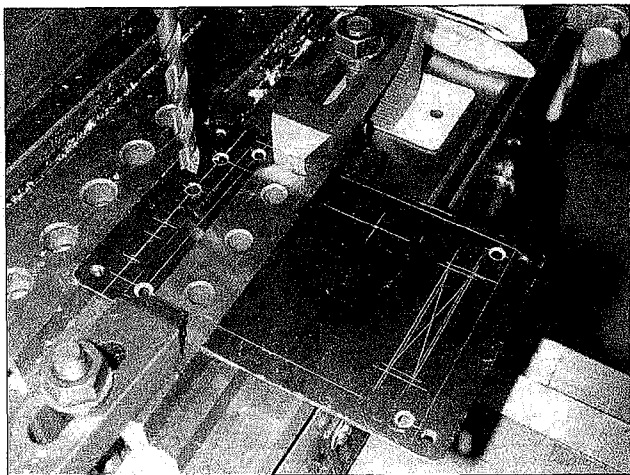


Photo E. Drilling the front panel.

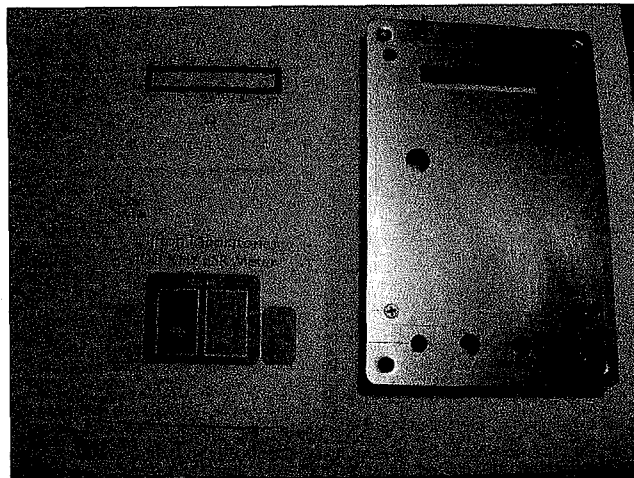


Photo F. The completed front panel and appliqué.

voltage should drop to 3.7 volts. These values are not overly critical, but you should see a good 1.75 to 2 volts swing between open-circuited and short-circuited input conditions.

LED display. With the input terminals short-circuited, you should be able to adjust the "zero adjustment" pot, R17, so that the first LED segment is illuminated. Temporarily connect a 10 ohm resistor across the input terminals. With the range switch, SW2, in low position, you should be able to adjust R24 so that the last LED is illuminated. Remove the 10 ohm resistor, connect a 51 ohm resistor across the input terminals, and place the range switch to the high position. You should be able to adjust R25 so that the last LED is illuminated. You may see a slight degree of interaction between the zero adjustment pot and R24 or R25.

Calibration

To calibrate the display, first verify the zero adjustment and that R24 and R25 have been accurately set as described earlier. With the range switch in low position, connect a 1 ohm resistor across the input terminals and note which LED is illuminated. Repeat with 2.7 and 5.1 ohm resistors. Switch to the high range and repeat with 1, 2.7, 5, 10, and 20 ohm resistors. The spacing will not be linear. You should use short leads when connecting the calibration resistors.

Mechanical

I designed the printed circuit board layout to fit a Radio Shack 270-1806 plastic box, 6"x4"x2". This box is a tight fit and requires the zero pot to be squeezed between the board and the front panel, but it permits a compact package.

tic.) I attached the plastic lens to the aluminum panel with a couple drops of super glue. Although a milling machine makes these tasks easy, you can accomplish the same with an electric drill and file.

I also made four custom-length spacers from 3/8-inch-diameter aluminum round stock and attached these to the front panel with countersunk 4-40 x 3/8-inch Phillips flat head screws. For my board, choice of IC sockets, and LED displays, the spacers were 0.680 of an inch long. I drilled and tapped the spacers for 4-40 threads. The aluminum cover plate is only 0.038 of an inch thick, so part of the tapered screw head appears on the inside of the front panel. Hence, you should countersink the spacer as well — otherwise the spacer will not be tight against the panel.

It's important that the heads of the screws be flush with the front panel if you intend to use a panel appliqué. It will be impossible to retighten the screws without destroying the appliqué once it is in place, so I used Loctite thread locker to prevent loosening.

I laid out the front panel appliqué using Visio Technical for Windows, but any drawing program would work. When you lay out the appliqué, place the calibration numbers to coincide with the spacing you recorded during calibration. I then printed the appliqué on an inkjet printer, and laminated it with a thin, flexible, self-adhesive transparent plastic sheet. After cutting

I milled a slot 2 inches long and 3/8 of an inch wide for the LED display. I also milled a 2-1/2 inch x 3/4 inch piece of 1/8-inch-thick red Lucite plastic to fit flush into the slot. (The Lucite lens resembles a mesa when done; a 2" x 3/8" rectangular section sticks up 0.040" from the body of the plas-

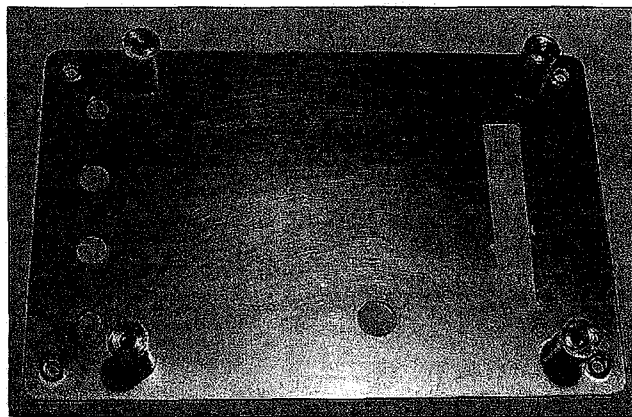


Photo G. Back view of the front panel showing the mounting spacers installed.

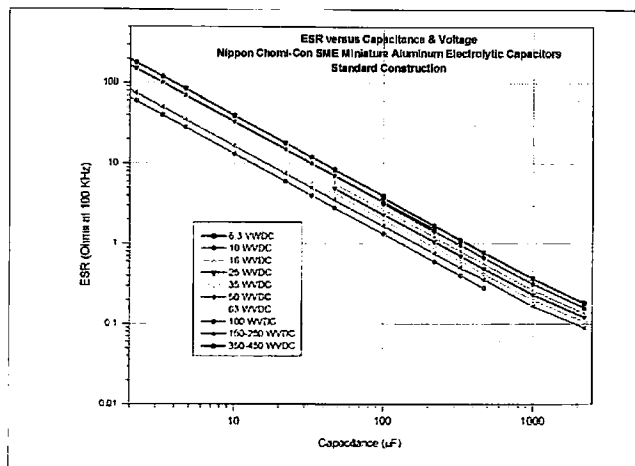


Fig. 7. ESR vs. capacitance & voltage: Nippon Chemi-Con SME miniature aluminum electrolytic capacitors, standard construction.

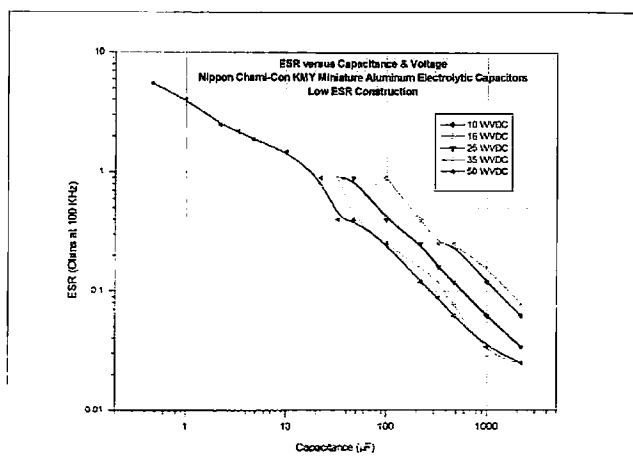


Fig. 8. ESR vs. capacitance & voltage: Nippon Chemi-Con KMY miniature electrolytic capacitors, low ESR construction.

out the LED window, I then attached the appliqué to the aluminum front panel with 3M artist's spray adhesive.

I had to do three panels before I got it close to right, so you can benefit from my mistakes:

- It's difficult to get the LED slot exactly right in the aluminum panel, so cut it a bit oversize and add a thick black mask to the appliqué. Cut the opening of the appliqué slot to match the LED size.

- Use special inkjet paper and use the high quality setting on your printer.

- A full-size zero adjustment potentiometer doesn't clear the PC board by much and requires bending some components out of the way. A miniature pot is a good idea.

- Give the Loctite enough time to set up before attaching the appliqué. I didn't, and you can see a blue circle where one screw leaked onto the backside of the appliqué.

- The front panel is only 0.038 of an inch thick, so it requires attention to prevent the countersink from going right through the panel.

- Precisely aligning the appliqué takes a bit of time. Accordingly, use an adhesive that allows sliding the appliqué over the panel. Contact cement is not a good idea!

- In general, remember the old carpenter's maxim: Measure twice, cut once.

would run the ESR meter from a 12-volt wall-wart power supply, I changed my mind and decided to make it battery-powered. I epoxied two 9-volt battery holders to the plastic case to

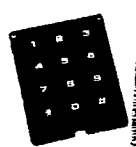

provide 18 volts in series connection. A pair of fresh alkaline batteries will give about 10–12 hours running time. Using a 78L09 with 18 volts input and a current draw of 50 mA places it at

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Although I originally thought I

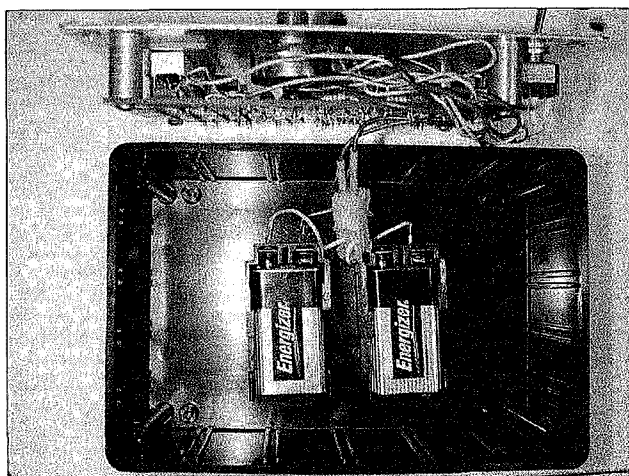


Photo H. Board mounted to the front panel and battery holders.

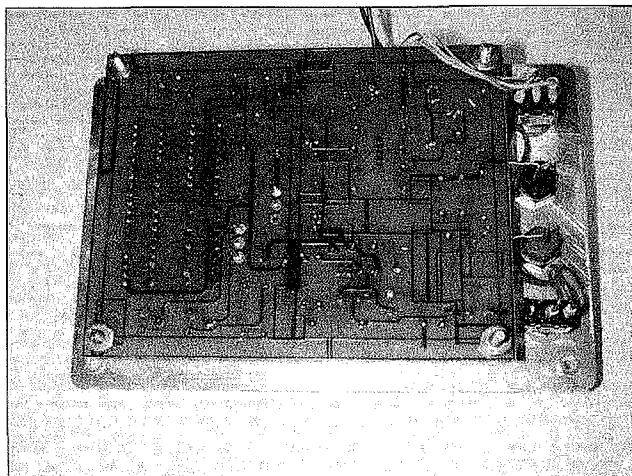


Photo I. Back view of PC board mounted on the panel.

the edge of its dissipation specifications. Hence, I made a heatsink out of a piece of 3/8-inch-diameter aluminum rod and slipped it over the 78L09.

How to use the ESR meter

It isn't usually necessary to remove a capacitor from its circuit before testing. Just put the test leads across the capacitor and read the ESR. Of course, first remove power from the equipment and allow time to discharge the capacitors. If you inadvertently attempt to measure a charged capacitor, diodes D2 and D3 will limit damage to the instrument.

Remember that long test leads, or coiled test leads, add inductance and will add some apparent ESR.

In general, the higher the voltage rating, the lower the ESR for the same capacitance. The larger the capacitance value, the lower the ESR. Tantalum capacitors have much lower ESR than an equivalent aluminum electrolytic. In addition, special low-ESR capacitors are made for switching power supplies and can have an ESR of a few milliohms.

I've plotted 100 kHz ESR data for two types of leaded aluminum electrolytic capacitors manufactured by Nippon Chemi-Con. These are only guides, however, and the best comparison will be a known good capacitor of similar value and voltage rating by the same manufacturer.

A defective electrolytic will display an ESR of several times that of a good unit.

References

1. Kemet Electronics has several technical notes available at its Web site [<http://www.kemet.com>]. Of particular interest are: *What is a Capacitor?* F-2856E; *Tantalum Leaded Performance Characteristics* (09/01 edition).
2. A data sheet for the LM3914

LED graph display chip can be found at National Semiconductor's Web site [<http://www.national.com/ds/LM/LM3914.pdf>].

3. Many capacitor manufacturers provide detailed ESR data. See, for example, Cornell Dubilier Electronics [<http://www.cornell-dubilier.com/>]. Nippon Chemi-Con's electrolytic capacitor catalog is available at [<http://www.chemi-con.co.jp/pdf/catalog/ALUMINUM/E/all/al-1001d-e-all-010730.pdf>]. AVX Corporation's ESR data for tantalum capacitors can be found at [<http://www.avxcorp.com/docs/masterpubs/tantlead.pdf>].

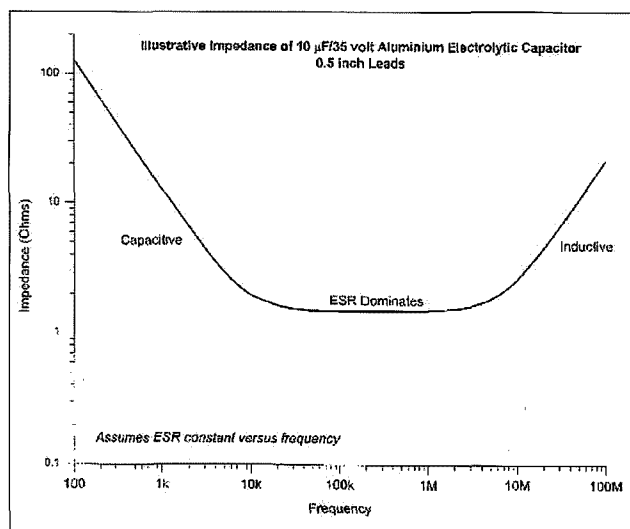


Fig. 9. Illustrative impedance of 10 μ F/35 V aluminum electrolytic capacitors, 0.5-in. leads.

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In the 1960s, Motorola developed the famous HT 200 "BRICK" handie-talkie, and the charger was as simple as it could get. A transformer, a diode, a pilot light, a line cord, a fuse, and a case to put it all in. There was no filter capacitor. The pilot light was used to limit the amount of current that would charge the nicad battery.

When someone discovered that this

circuit could overcharge the battery if left on for an extended period of time, another pilot light and an SPDT switch were added. One light was used for high current and the other for trickle charge.

Fig. 1 is the simple circuit that was used at that time.

Most batteries are "CURRENT" sensitive, not "VOLTAGE" sensitive, except for the relatively new Li-on, "lithium ion" types. These are quite voltage sensitive and SHOULD NOT BE CHARGED IN OTHER THAN AN APPROVED Li-on charger. Limit the current and you can charge most batteries with almost any voltage higher than the rated battery voltage.

Nicad batteries, as well as other types, are rated in ampere hours. Manufacturers rate their batteries according to the chemistry used. One may rate an AA battery at 600 mAh (milliampere hours), while another may rate theirs at 800 mAh. Table 1 shows some examples of popular battery cell manufacturers as they rate their cells.

This means that an 800 mAh battery cell is expected to deliver 800 mA for 1 hour, before dropping to the 1.1 volt per cell rating that is a standard adopted by most of the industry. Some manufacturers say 1 volt per cell. This is true in all nicad battery packs of all sizes and types. If a cell is allowed to

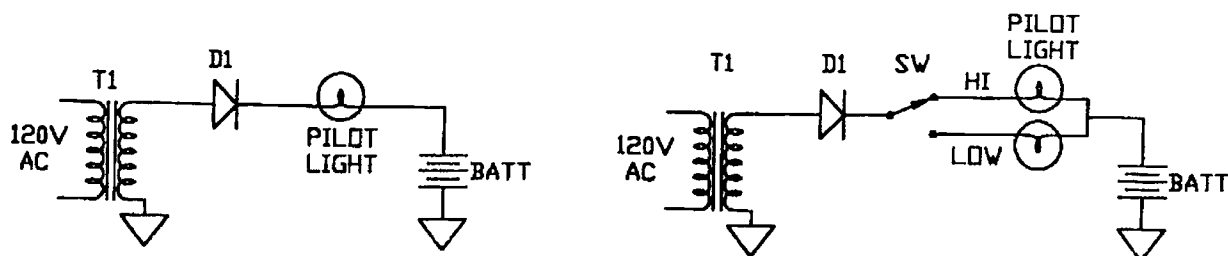


Fig. 1. Motorola HT200 charger circuits.

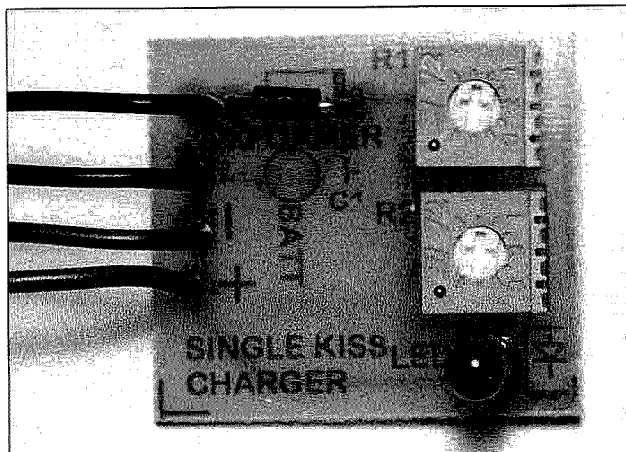


Photo A. Completed single-unit charger.

go to zero volts, there is an 80% to 90% chance of cell voltage reversal, and resulting destruction of that cell. It is

Type	Size	Capacity (mA)
Globtek NiCad	AAA	300
	AA	600-900
	Sub C	1300-1800
	C	2000-2500
	D	4000-4500
Globtek NiMH	AAA	550
	AA	1200
	Sub C	1800-2400
	C	3200-3500
	D	9000
Panasonic NiCad	AAA	250-280
	AA	560-1080
	Sub C	1350-2100
	C	2300-3000
	D	4400-5500
Panasonic NiMH	AAA	550-650
	AA	1000-1500
	Sub C	2800
	C	—
	D	6500
Sanyo NiMH	AAA	730
	AA	1450-1650
	Sub C	2100-3000
	C	—
	D	7300

Table 1. Some examples of popular battery cell manufacturers as they rate their cells.

almost impossible to ever reverse this problem.

Never discharge a battery completely

Most manufacturers of battery-operated equipment such as HTs, camcorders, and laptop computers tell us to "COMPLETELY"

discharge the battery once in a while and then recharge it. Taking this literally, you might be tempted to use a pilot light or a short piece of wire across the terminals to DISCHARGE the battery completely. DON'T DO IT! In most cases this will destroy the battery. What the manufacturers really mean is to use the low voltage indicator that is built into most devices that

shuts down the equipment when the battery reaches approximately 1.1 volts per cell, as an indicator, and to then recharge the battery. They don't mean to run the battery down to zero volts.

Most of us have many battery-operated devices and if we had to have a separate, expensive charger for each of the devices we could fill a small room with the chargers. Would you like to have a charging device that could charge and or maintain charges on AAA, AA, sub C, C, D, and 9-volt types almost all at one time? Well, read on ...

Remember, nicads and most battery types are not voltage-sensitive. Depending on your choice of the power transformer for the circuit, you could easily charge 8 battery cells at one time, except the "D" and 9-volt types. D cell types would need a little more current for trickle charge than the standard 20 mAh LEDs will handle. For the D cells use the high-current 50 mAh LEDs. Use 2 volts per cell to calculate

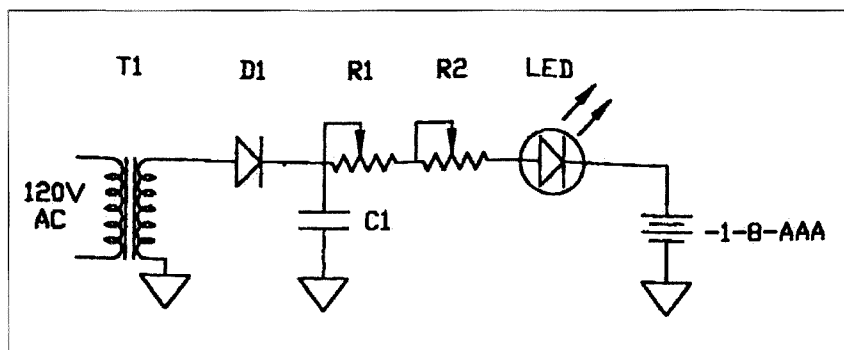


Fig. 2. New charger, single circuit.

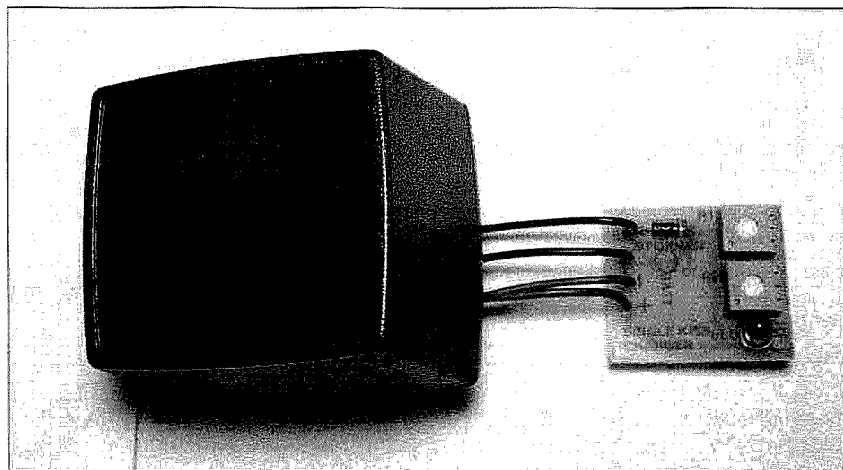


Photo B. Completed single-unit charger with wall-wart-type power supply.

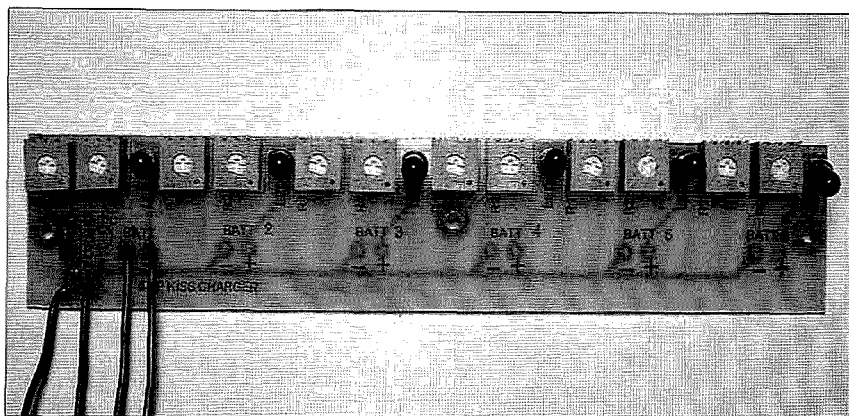


Photo C. Completed six-unit charger.

your transformer size and you won't go wrong. All 9 volt batteries are NOT really 9 volts. There is not enough room in the standard package for enough high current cells for 9 volts. Some battery packs use more lower

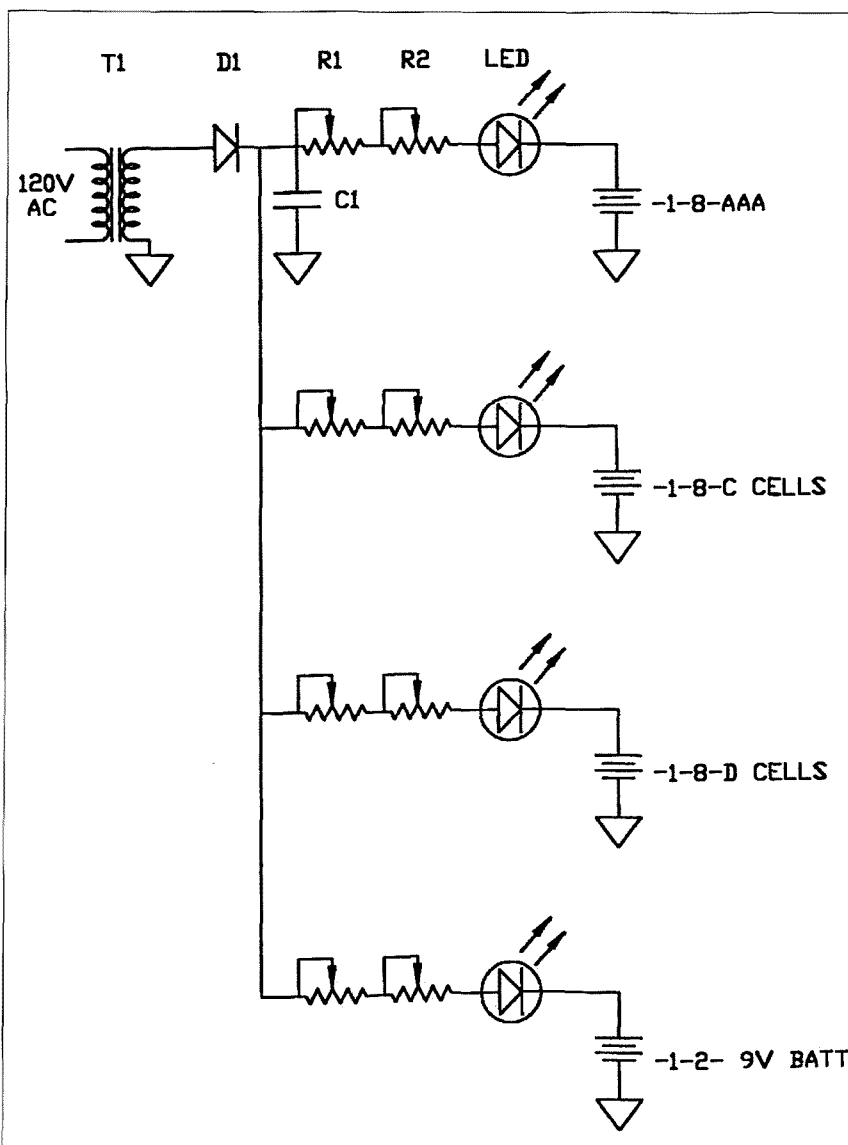


Fig. 3. New charger, 4 circuits.

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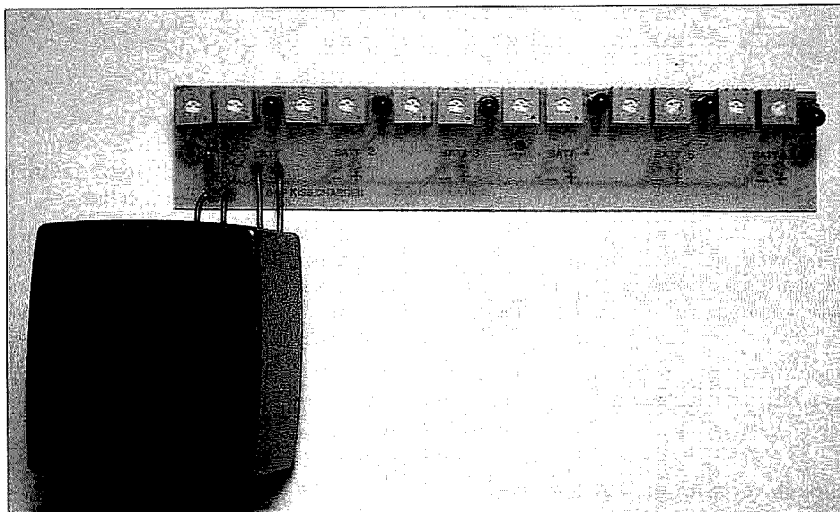


Photo D. Six-unit charger with wall-wart-type power supply.

current cells that add up to 9 volts but have lower current available. Read the battery label carefully.

Let's look at a circuit that will charge and or maintain the health of ALL rechargeable batteries including lead-acid, nicad, and nimh. ALL of these battery types can be charged by limiting the charging current.

Let's use 8 "AA" batteries for starters. So $8 \times 2 \text{ volts} = 16 \text{ volts}$. There are lots of 18-volt transformers available at hamfests, Radio Shack and other stores for not much cost. Look for a "wall wart" or plug-in transformer

with AC or DC output. At this point it won't make any difference which one you find. Either will work in this circuit. The type, AAA to D and the number of cells you want to charge will determine the current capacity of the transformer needed. If you use the single charger circuit, a transformer with only 20–30 mAh capacity is all that's needed. If you use the 4-circuit board and choose to use ALL high-current LEDs, use $4 \times 50 \text{ mAh}$, or about 200–250 mAh transformer capacity.

Batteries are charged with the industry standards in mind. Let's assume the

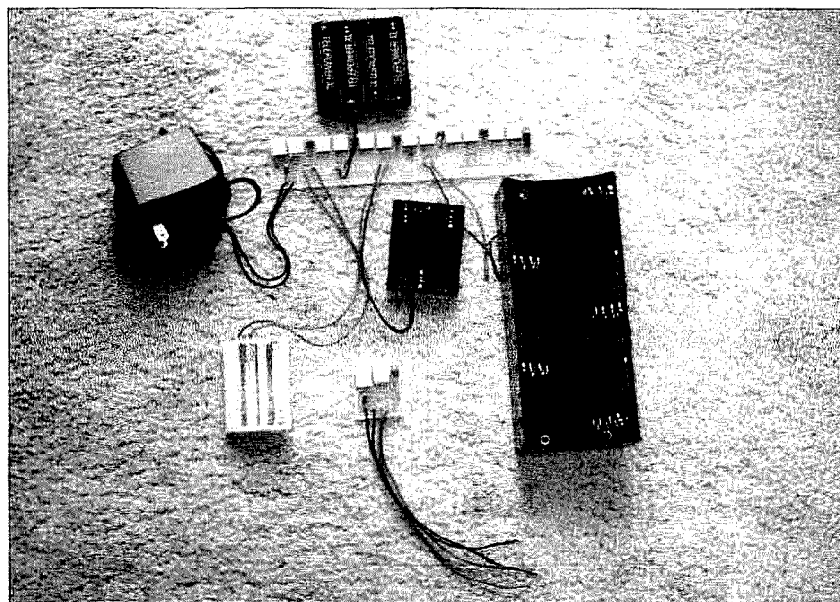


Photo E. This versatile charger is able to charge up to six different configurations of batteries, from single cells to battery packs, all at different voltages and currents at the same time.

Part	Description	Radio Shack #	Cost
T1	Pri 120 VAC, Sec 25 VAC	273-1366	\$5.99
D1	Diode, 2 per pack	276-1102	\$0.59
R1, R2	2k pot, each	900-4673	\$1.19
LED	Regular 20 mA LED, 2 per pack	276-330	\$1.29
	AAA dual battery holder	270-398B	\$0.99
	AAA quad battery holder	270-411	\$1.49
	AA dual battery holder	270-408	\$1.49
	AA quad battery holder	270-391	\$1.69
	C dual battery holder	270-385	\$1.49
	C quad battery holder	270-390	\$1.59
	D dual battery holder	270-386	\$1.69
	D quad battery holder	270-396	\$1.79
C1	Almost any small filter cap	—	—

Table 2. Parts list.

AA cells in the above example are the 800 mAh type. The standard rate of charge is 10% of their rated capacity for 12–14 hours. This comes to approximately 80 mA. Any more, or any longer may damage the battery with excess heat. After the 12–14 hours, at the standard charge rate, use 10% of the standard charge rate or approximately 8–10 mA. The battery at this rate can be charged forever. I have some Dustbusters that have been charged this way for years with NO problems. It might be desirable to have several "maintenance chargers" all going at the same time for maximum utility and usefulness.

Most cells or batteries have the rated capacity indicated on them. From that information you can calculate 10% of rated capacity for the 12–14 hour charge, then 10% of that figure forever after.

The circuit in **Fig. 2** is simplicity in itself. If the wall wart supply you are using has a DC output, you save the cost of putting a simple diode and capacitor on the PC board. Simply put a jumper in place of the diode on the board and leave out the filter cap. If the

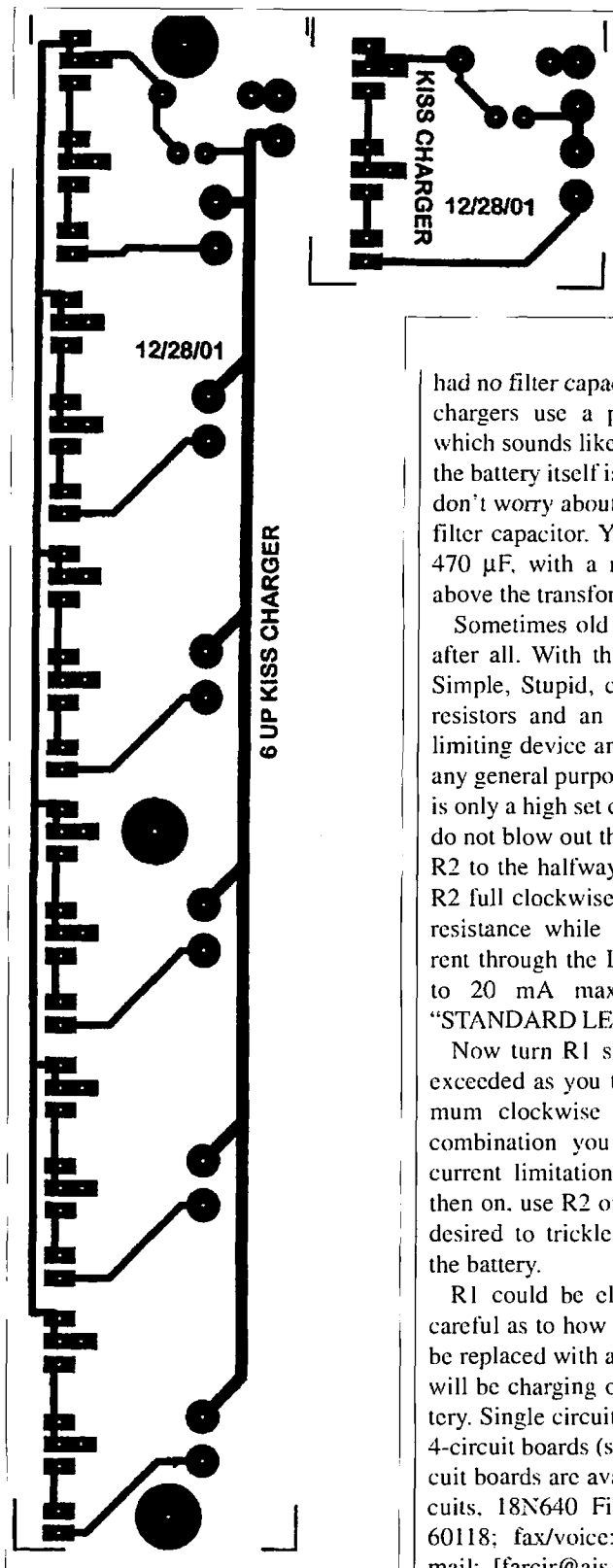


Fig. 4. PC board foil layout, 1-up and 6-up.

wall wart is AC output. install D1 and the filter cap on the PC board.

Remember, the Motorola charger

had no filter capacitor. Most of today's chargers use a pulse charge circuit, which sounds like AC, doesn't it? Well the battery itself is a very good filter so don't worry about installing much of a filter capacitor. You can use 22 μ F to 470 μ F, with a rated voltage that is above the transformer output voltage.

Sometimes old ideas are not so bad after all. With this NEWER, Keep It Simple, Stupid, circuit, we use small resistors and an LED as the current limiting device and an indicator. D1 is any general purpose rectifier diode. R1 is only a high set current limiter so you do not blow out the LED. Turn R1 and R2 to the halfway position. Then turn R2 full clockwise slowly to minimum resistance while monitoring the current through the LED; and the battery to 20 mA maximum if you use "STANDARD LEDs."

Now turn R1 so that 20 mA is not exceeded as you turn R2 to the maximum clockwise position. With this combination you cannot exceed the current limitation of the LED. From then on, use R2 only to set the current desired to trickle charge or maintain the battery.

R1 could be eliminated if you are careful as to how you set R2, or it can be replaced with a fixed resistor if you will be charging only one type of battery. Single circuit boards (see Fig. 2), 4-circuit boards (see Fig. 3), and 6-circuit boards are available from Far Circuits, 18N640 Field Ct., Dundee IL 60118; fax/voice: 847-836-9148; E-mail: [farcir@ais.net]. Or the circuit can be built in about the size of a postage stamp on a simple vector- or prototype board.

Remember, I stated that you could literally charge as many types and

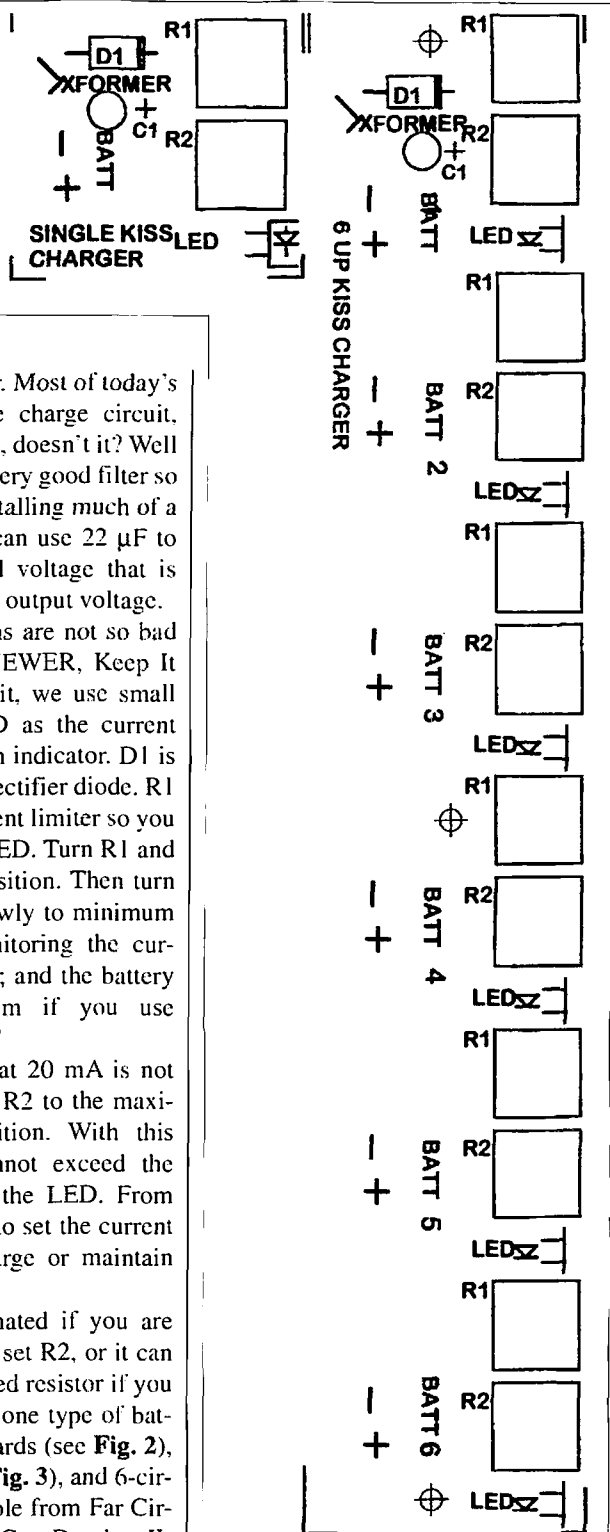


Fig 5. Component placement.

quantities of batteries as your heart desires. With the 4-circuit board you could charge some AAA, AA, C, and 73 *Amateur Radio Today* • January 2003 23

Handy Milliammeter

I think that most of us at one time or another have had the need, and or the desire, to measure the current in a battery-operated device. Many of these devices have a battery holder where the battery or batteries snap down into a "well" or pocket. Getting a multimeter in series with the batteries sometimes can be very trying.

Here is a device that I have used for years with great success. Get a piece of the thinnest double-sided PC board material that you can find — some is made about 0.015 thick. It can be found in ample supply at most hamfests. (If you are buying the K.I.S.S. Charger boards from Far Circuits, they might send a small piece of the thin PC board material for this project, if you ask.) Cut it to about 2–3 inches long and by about 1/4 inch wide. If you make it wider you will not be able to use the same board on some AAA battery devices. Material that thin can be cut easily with a pair of scissors — just don't let the YL catch you using her good pair ...

Next, sharpen one end like a screwdriver blade or chisel. Make the angle as shallow and as sharp as you can; it will make the insertion, as described later, much easier. Next, at the other end solder a short piece of wire to each side of the PC board material, something that you can attach your multimeter to on each side.

I have one with short bare wire leads AND small test lead sockets; that way, I can use alligator clips or just plug the multimeter leads into the sockets.

Have you figured out where we are going with this yet? Just slip the sharpened end of the PC board material between 2 batteries or between a battery and the contact on the device that you are going to measure. This opens up the battery circuit and puts your milliammeter in series so that you can measure the current that your device is drawing.

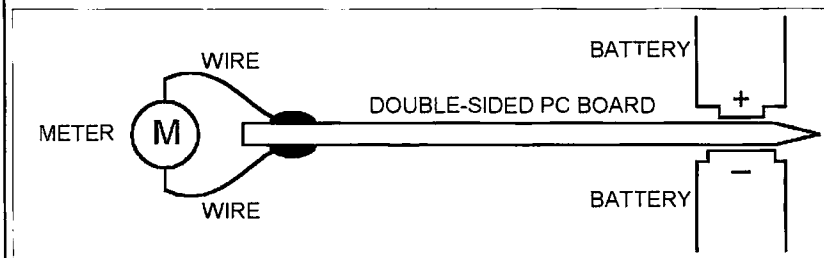


Fig. S1. Milliammeter adapter.

9-volt batteries all at the same time and at different charge rates for each charger circuit.

I use snap in battery holders similar to the Radio Shack part numbers listed in Table 2, or you might already have a good junk box with some in it.

I have several 6- and 8-cell battery holders and if I do not have many cells to charge at a time, instead of soldering the charger output wires to the holders. I use alligator clips to hook up the needed number of cells. The individual cell connections are easy to get at in most of the cell holders.

If you have battery packs, such as used in HTs, camcorders, computers,

etc. with no way to attach alligator clips, etc., to them, try this. Take a thin piece of wood with 2 nails driven through in the proper place, fasten the charger leads to them, and lay the battery contacts on the nails. Something a little more universal and easy to configure would be a thin piece of cardboard, with thumb tacks pushed through in the proper places; again, just lay the battery contacts on the sharp end of the tack ... crude but it works, and can be configured for most battery types. The contacts on most batteries are steel, does that light up a bulb in your mind? Try using small magnets with wire leads to the charger. This works just fine.

The circuit is so simple and low cost that almost any number of them can be tied to ONE transformer. The "COMMON LED" has a current limit of about 20 mA. This is enough to trickle charge and maintain all common cells up to full size "C" cells. There are several manufacturers of HIGH-CURRENT LEDs that will handle 50 and 60 mA. They would be ideal for "D" cells and 5-amp lead acid types. Just substitute the high current LED for the regular one on one board for your higher current applications, or you could take a step backward in technology and use the grain-of-wheat-size incandescent bulbs at the proper current rating.

For those among you who like to experiment, here is a new route to pursue ...

For a little more than a year I have been trying something different, but it is a little early to make too much of a definitive statement. We have all read that many chargers today use a pulse charging system that is hard for many of us to duplicate with the surface mount parts that are being used. I have been trying a system using FLASHING LEDs, instead of regular LEDs. First, most flashing LEDs will handle up to 70 mA; this can be a bonus when charging C and D or high-current cells or batteries. Another plus is that you can still use this same PC board: just use the flashing LEDs in place of the regular ones. Now the DOWNSIDE — they cost more.

The current is hard to measure IN THE FIELD, because it is pulsed, and most analog and or digital meters will give false readings. One partial way around measuring the current is to set the current with a regular LED installed, then put in the flasher. This SEEMS to work OK in most cases; some regular LEDs will take 50–70 mA for a short period of time, long enough to set the current properly. One more plus and/or minus is that in "theory" it will take twice as long to charge the battery because of the 50% duty cycle flashing on and off. On the other hand, pulse charging is supposed to take less time to charge.

Continued on page 56

Experimenting with Hall-Effect Sensors

For fun and knowledge.

There are times hams get involved in some interesting technological experiments. Some of those experiments develop projects that apply to electronics and ultimately to ham radio.

Because of my interest in both experiencing technology and developing test equipment to make my life easier at the workbench, I tackled Hall-Effect sensors to see what I could learn about them and perhaps find an application for ham radio.

What's a Hall-Effect sensor? I'm glad you asked that question. Hall-Effect sensors are semiconductor devices that are sensitive to the presence of a magnetic field. When in the presence of a magnetic field they provide a voltage change response as a function of the flux field intensity. In fact, the sensors are also sensitive to the flux line direction as produced by a magnet.

I have an early date code sensor made by TI and I've been told that those early sensors were subject to thermal drift — mine exhibits a little. But the sensors being manufactured today by Allegro Micro Systems are temperature-stabilized using a technique referred to as "chopper-stabilization." Perhaps the using circuit is more subject to temperature effects than is the sensor itself.

I suppose your next question is, "So what is a Hall-Effect sensor good for?" Again, that's a good question as it leads me into a discussion of them.

Actually, the use/application of a Hall-Effect sensor is limited only by your imagination. They come in two types: switching and ratiometric (linear). I'll limit my discussion and experiments to the linear sensor, since it offers the greatest window of opportunity for ham project development.

Applications

My personal interest in the Hall-Effect sensor was in understanding the linear device, though switching sensors are very important contributors to many project applications. In fact, Hall-Effect switching sensors were used in some computer printers to sense the end of carriage travel. They also work well in burglar alarm window and door movement detection in addition to a multitude of other uses.

I'll cite a few applications to give you a kick-start with ideas, but you need to think of additional applications as they apply to your needs and environment. Here is just a sample of possible uses: magnetic flux indication and intensity measurement; magnetic polarity detection; current sensing (AC and DC); power sensing; current trip point detection; strain gauge sensor;

movement sensing and direction of movement; rate of change (movement); proximity sensing; liquid-level sensing; noncontact sensing; RPM measurements; object speed of acceleration/deceleration; position limit detection/switching; antenna position sensor; and wind direction and velocity sensor.

Experiments

To gain an understanding of how Hall-Effect sensors function, I set up a series of experiments on my workbench to evaluate the linear device that was available to me. It was a sensor manufactured by TI, circa 1985. The first step was to set up a circuit with sufficient metering to allow interrogation of the device to see how it reacted. **Photo A** shows the top side of my test board, and **Photo B** shows the bottom side. Operating at DC levels, the only purpose of the board was to keep all of the parts conveniently flying in formation.

Having limited previous experience with Hall devices, I wasn't sure what to expect, so that metering was essential. **Fig. 1** shows the basic circuit that I used to begin experimentation. For the first experiment, the objective was

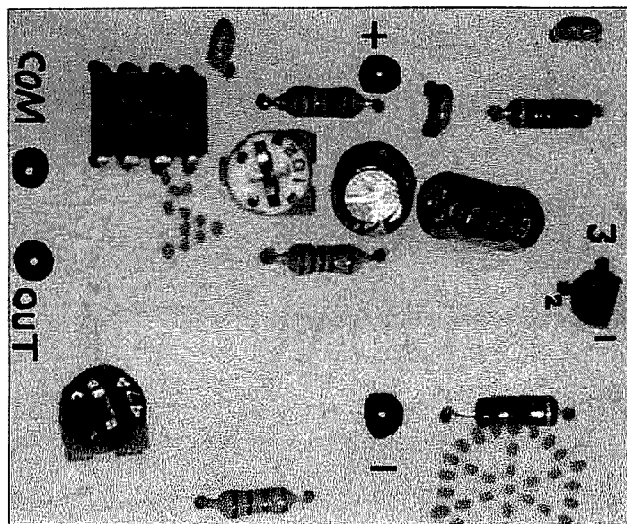


Photo A. Top side of the circuit board used for experimenting with Hall-Effect linear sensors.

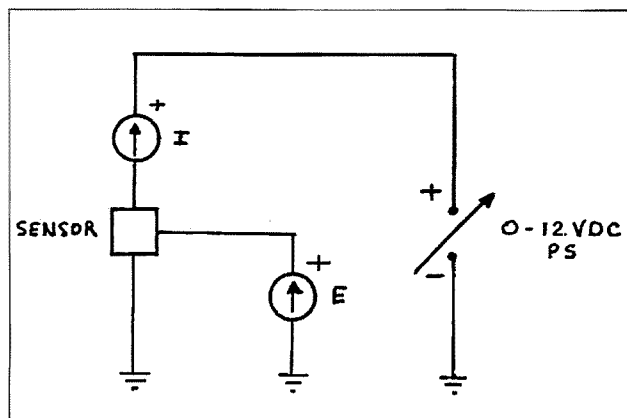


Fig. 1. Basic circuit used for the first tests performed with a Hall-Effect sensor.

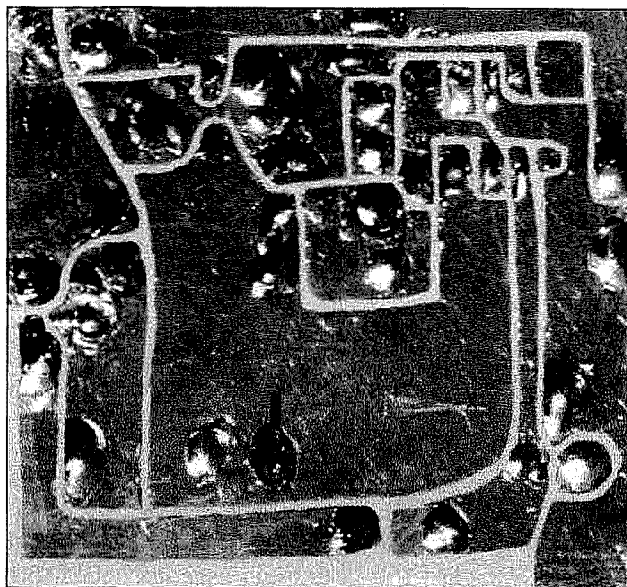


Photo B. Bottom side of the circuit board.

to determine device pin functions and to apply a suitable voltage to see how the device would respond. After doing an Internet search I determined that no test or technical data was available for my sensor. However, I did obtain comparable data from Allegro Micro Systems. Fig. 2 shows the basic empirical spec information that I discovered through experimentation, allowing the TL173C sensor to be used in a project.

Once power was applied I determined that the nominal output voltage was approximately $V_{cc}/2$, and that was a good sign, but at that moment I didn't know what else to expect in the way of a response to a magnetic field. I did note that the sensor's output voltage was subject to change as a function of V_{cc} . Therefore, stabilizing the V_{cc} value with a regulator would be required for solving any serious stability issues. But for my experiments, only a small amount of regulation was used.

Knowing that a Hall device is sensitive to a magnetic field, I did wave a magnet close to the sensor and got an indication, though at a magnitude well below that expected. What I expected was the output voltage to swing between V_{cc} and ground during the test — but a much lesser swing was observed. Fig. 3 shows the second test that I performed and the response obtained. The graph shows a generalized operational curve and a voltage swing away from QOP (Quiescent Operating Point) along the curve relative to the presence of a magnetic field.

It occurred to me that the magnetic lines-of-force had to pass through the device for it to respond properly. As I determined later, the Hall device that I was using provided a response perhaps in the range of 1–2 mV/gauss. Devices available from Allegro Micro Systems vary in detection sensitivity by device and provide an output from about 1 mV/gauss up to 5 mV/gauss.

With a VOM set to the 3-volt range and attached to the output pin of the sensor, a horseshoe-shaped magnet was

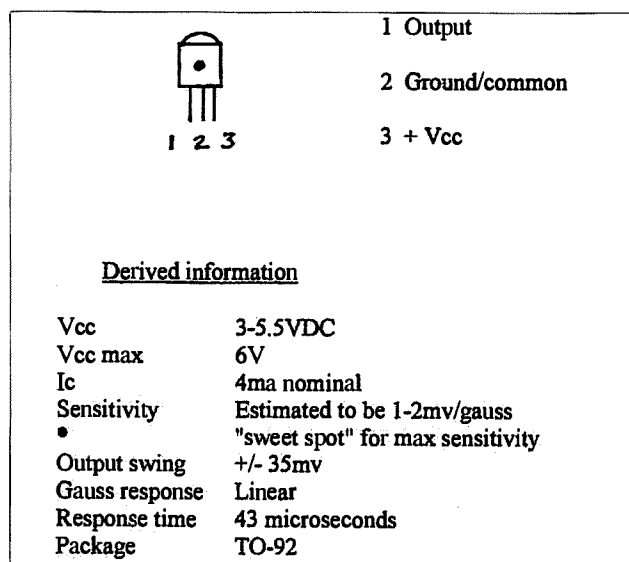


Fig. 2. The above data on the TL173C linear Hall-Effect sensor was derived empirically from experiments performed during bench testing.

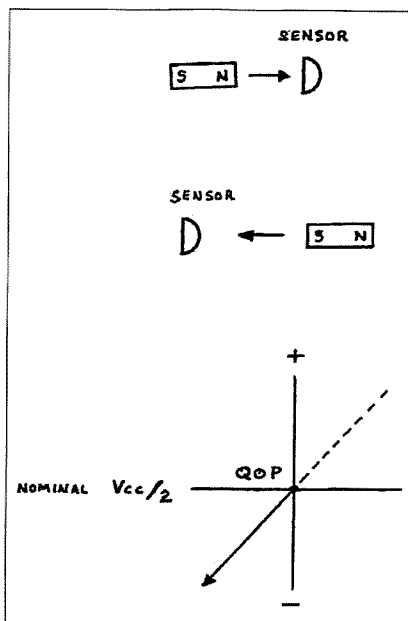


Fig. 3. Experiment showing the direction of voltage output from the sensor as a magnet of given polarity approaches the sensor. Approaching as shown, the output voltage decreases.

slipped over the Hall sensor. The output responded sufficiently to be evident, but not at a desirable level. However, the response was markedly greater than when only a single magnetic pole approached. My particular sensor provided a direct output voltage swing in the range of 25–30 mV. To obtain a larger output voltage swing, I assembled an amplifier using an LM741 op amp. A complete test circuit is shown in Fig. 4. Details of the amplifier will be discussed in another section. Now, knowing what to expect from the device made the remaining experiments much easier.

Several setups using magnets utilized in various positions provided some really interesting insight into possible device applications. During the initial experiment, a horseshoe-style magnet was used. A “sweet” spot was determined to exist at the near center of the device package. Another experiment involved placing a fixed magnet on one side of the sensor while approaching the sensor with a different magnet from the opposite side. The first magnet biased the sensor and shifted QOP along the response curve. Although the biasing magnet caused

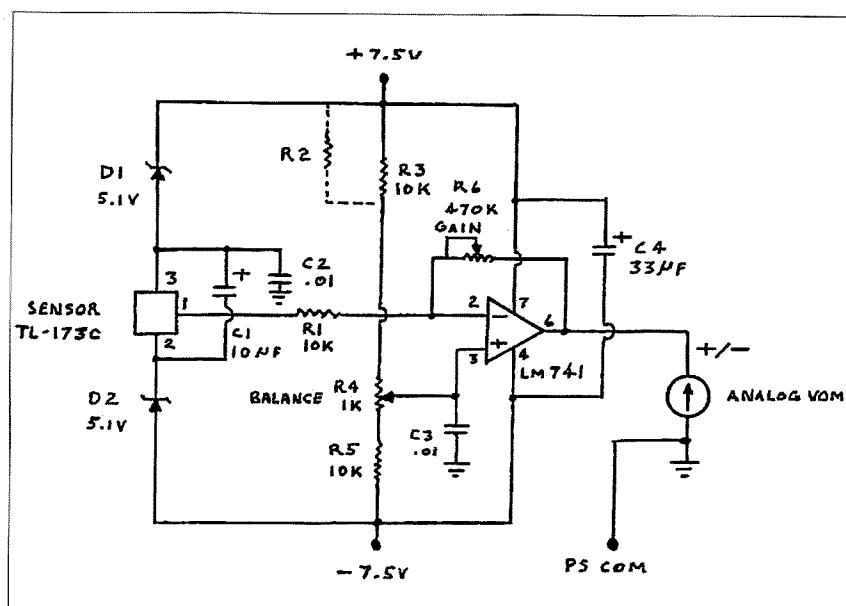


Fig. 4. A complete circuit used for testing and evaluating a TL173C Hall-Effect sensor. An op amp is used to raise the sensor's output voltage swing sufficiently to drive an analog VOM. Resistor R2 is used to create a balanced input into the op amp.

the output voltage to shift up or down (flux polarity) the operational curve, the detection sensitivity appeared to remain constant. Biasing the sensor to one side of its operational curve allows the device more room to swing in a given direction, placing the output voltage above or below the nominal $V_{cc}/2$ value. With an approaching magnet, the output would change as a function of field strength and distance to the opposite voltage value (if biased below, it would swing to a value above nominal).

In addition, with a biased sensor, as shown in Fig. 5, the approaching metal

needn't be a magnet as long as it is ferrous. I tried approaching the sensor with a nonmagnetized metal shaft of a screwdriver, and the sensor was able to detect both the presence and movement of the shaft. This experiment implied that a biased sensor would work well as a tachometer or as a position sensor of a rotating antenna system.

Fig. 6 shows how the sensor may be used as a “null” or “off-null” sensing device. Any movement of the magnet right or left of the null point will cause the sensor's output to create a voltage

Continued on page 28

Amplifiers, ATU Down Converters & Hard to Find Parts

<h3 style="margin: 0;">LINEAR AMPLIFIERS</h3> <p>HF Amplifiers PC board and complete parts list for HF amplifiers described in the Motorola Application Notes and Engineering Bulletins:</p> <table style="width: 100%;"> <tr> <td>AN779H (20W)</td> <td>AN758 (300W)</td> </tr> <tr> <td>AN779L (20W)</td> <td>AR313 (300W)</td> </tr> <tr> <td>AN762 (140W)</td> <td>EB27A (300W)</td> </tr> <tr> <td>EB63 (140W)</td> <td>EB104 (600W)</td> </tr> <tr> <td>AR315 (300W)</td> <td>AR347 (1000W)</td> </tr> </table>	AN779H (20W)	AN758 (300W)	AN779L (20W)	AR313 (300W)	AN762 (140W)	EB27A (300W)	EB63 (140W)	EB104 (600W)	AR315 (300W)	AR347 (1000W)	<p>2 Meter Amplifiers (144-148 MHz) (Kit or Wired and Tested)</p> <table style="width: 100%;"> <tr> <td>35W - Model 335A</td> <td>\$79.95/\$109.95</td> </tr> <tr> <td>75W - Model 875A</td> <td>\$119.95/\$159.95</td> </tr> </table>	35W - Model 335A	\$79.95/\$109.95	75W - Model 875A	\$119.95/\$159.95	<h3 style="margin: 0;">HARD TO FIND PARTS</h3> <ul style="list-style-type: none"> • RF Power Transistors • Broadband HF Transformers • Chip Caps - Komei/ATC • Metalized Mica Caps - Unelco/Semco • ARCO/SPRAGUE Trimmer Capacitors <p>We can get you virtually any RF transistor! Call us for “strange” hard to find parts!</p> <h3 style="margin: 0;">DIGITAL FREQUENCY READOUT</h3> <p>For older analog transceivers TK-1 (Wired and Tested) \$149.95</p>
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Model 59 Heat Sink (6.5" x 12" x 1.6") \$24
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Low Pass Filters (up to 300W)
for harmonics \$12.95
Specify 10M, 15M, 20M, 40M, 80M or 160M
HF Splitters and Combiners up to 2KW

Experimenting with Hall-Effect Sensors

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and polarity change appropriate to the direction and magnitude of the response.

Temperature drift

During my experiments, some heating drift was noted; it was traced to the TL173C sensor. The drift occurred only during the first 2–3 minutes following the application of power before stabilization occurred. Pinching the device with my fingers reduced the internal heat level and that effect was noted in the output voltage indication. Drift occurred until the sensor again stabilized at a temperature value. Judging from the Allegro Micro Systems' published information, sensors manufactured by them are chopper-stabilized to reduce or stop the tendency for thermal drift susceptibility.

Response linearity

From my experiments, I was able to determine two very important facts that relate to any application of the device. The output response is absolutely linear within the limits of the device as a function of gauss level. The assumption is that any open gap between the sensor and metal flux conductor remains constant as the gauss level varies.

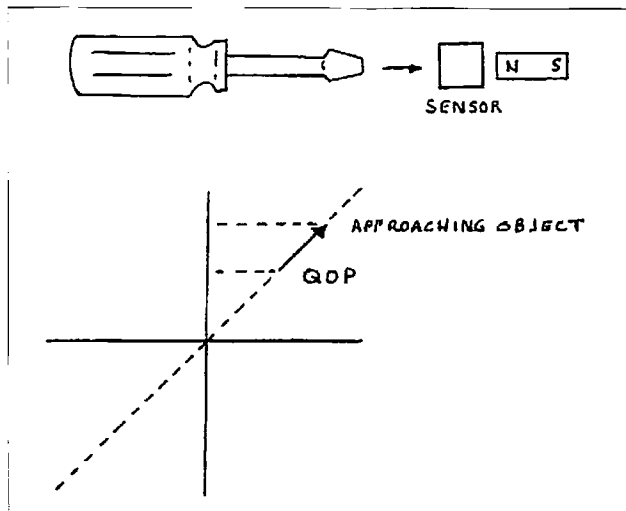


Fig. 5. Experiment showing how the sensor responds to the movement of a non-magnetized ferrous object. A biasing magnet is placed on the opposite side of the sensor from the ferrous object.

The second fact relates to the magnetic gap. If the gauss level remains constant, the output response is non-linear as a function of the gap width change. My method of measurement was very crude, but it did definitely prove the effect. For this measurement, I placed a plastic measurement scale in front of the sensor to identify physical movement distances. Magnet location distances were plotted against the indicated output voltage creating a curve approximating the letter "S".

Field polarity

What was interesting to me during the experiment was the determination that the direction of the magnetic field (flux line direction) was detectable. As shown in **Fig. 3**, reversing the magnetic poles caused the output voltage to reverse direction. As an example, if the output was indicating a positive offset of 1 volt from QOP (VOM reading), reversing the magnetic polarity caused the output voltage to drop 1 volt from QOP. This experiment also supported the theory of a linear response as a function of flux density.

Frequency response

Hall sensors are sensitive to motion that translates to an AC function. But what is the highest frequency that can be detected by a sensor? Actually, the frequency response is very low as

compared to most ham radio applications where RF is involved. The highest-response frequency, from what I've been able to determine, was 23 kHz for the TL173C device. Perhaps newer sensor designs will allow for an increase in response frequency. For non-RF applications, a response of 23 kHz is generally fast enough to be usable as a movement

sensor/detector. The frequency of 23 kHz translates to a response time of 43 μ sec. For most any ham application, that response time is perhaps sufficient to meet most needs.

Amplifier

Because the voltage output swing from the TL173C sensor was in the range of 25–30 mV, I elected to increase the output level using an LM741 op amp. My objective was to drive an analog VOM operating on the 3-volt range to a discernible level. That objective was achieved with the circuit shown in **Fig. 4**. Using my particular test magnet, the output voltage would swing up to 2+ volts from QOP.

Knowing that op amps generally exhibit some output offset, and my TL173C produced an output voltage of approximately 1 volt above $V_{cc}/2$, I elected to equip the amplifier with two potentiometers. One pot was to provide a voltage to balance the offsets, and the other was for gain control. With the nearly 1 volt offset of the sensor's output voltage, I found it necessary to parallel the upper resistor, R3, with a shunting resistor, R2. When

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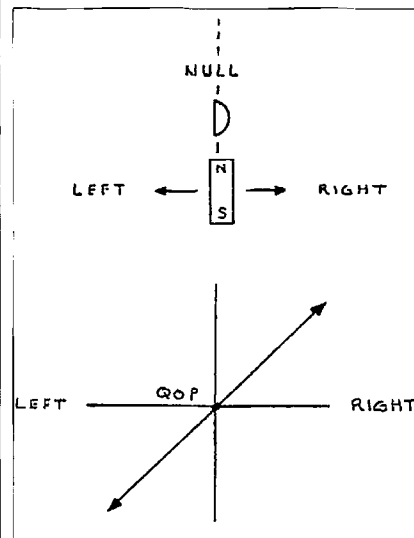


Fig. 6. Experiment shows the output voltage change as a function of a magnet's position. A null occurs (at QOP) when the magnetic pole is centered with the sensor. Reversing the magnetic poles also reverses the output voltage response.

On the Face of It, A Good Idea

How to ace those finishing touches on your home-brewed pride-and-joys.

Sometimes all the hard work and technical expertise that goes into creating your own home-brewed equipment can be for naught if the finishing touches of the unit are less professional-looking than the remainder of it. Some prior planning and carefully applied labels can be the difference, producing a piece that works and looks great.

When deciding to make a particular unit — let's just suppose the project is to be a QRP receiver — take a good look at the schematic and identify all of the variable controls, e.g., RIT, VOLUME CONTROL, TUNING CONTROL, AUDIO FILTER CONTROL, etc. Next, lay out the controls according to their usage. For a right-handed operator this usually means placing the tuning control either in the center of the front panel or to the extreme far right side of the front panel. Other controls are placed from the left edge of the panel.

Placing the tuning control on the right side or center of the panel creates an easier, more comfortable operating position for the operator. Avoid placing the headphone jack near the tuning control. The plug and wire protruding from the panel often interfere with the operator's hand motion during tuning, and can be avoided by placing this jack as far away as possible.

The "key" jack can be placed immediately above or below or alongside the "phone" jack if the tuning control is on the right side. If the tuning control is in the center, other jacks can be mounted

in the area to the right provided there is ample room. Use your own judgment here. See **Photo A**.

Before drilling holes to mount front panel controls, measure the needed height from the bottom of the panel to ensure that variously sized controls will "fit" above the bottom edge of the front panel.

Once you are satisfied that all the controls will fit acceptably, measure how far up the panel the mounting holes will have to be placed. Now, using the

knobs you intend to place on the controls, ensure that the outer edge or "skirt" of each knob clears the bottom edge. Knobs having a flare or "skirt" on their outer edge call for more room at the bottom of the panel for clearance.

Lettering to be placed *below* a control also requires additional space. Large knobs block the operator's view of the lettering, especially on smaller pieces of equipment. The identity of controls not easily visible to the operator can be confusing during operation and detract



Photo A. Finished project with tuning control in the center.

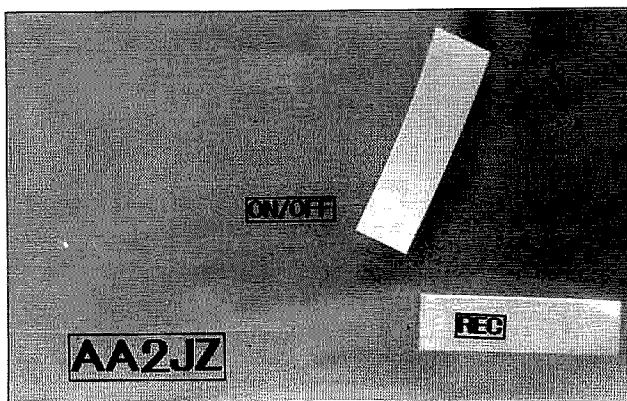


Photo B. Place lettering on a clean sheet of glass to ensure that you can make straight cuts when you remove the excess backing material.



Photo C. Painter's tape is used to guide lettering into perfect alignment.

from the "professional" appearance desired in a finished project. This also applies to multiple rows of controls. Allow additional space between rows for lettering if needed.

Lettering the project requires some prior planning. I use a "tape writing machine," a device which uses clear tape with white or black lettering imposed on it. With this device I can select a type size or style that pleases me and fits the area available on the front panel. Computer-printed lettering can be used. Experiment with various gummed labels, paper, and adhesive-backed tape on label sheet backings to see what is acceptable to you.

After typing and printing the required data, I peel the backing and adhere the tape or label to a clean sheet of glass. Avoid putting finger prints in the adhesive material. They are often impossible to remove, and are readily visible forever. Use the tip of an object (knife, razor blade, screwdriver, etc.) to pick up the label and place it on the glass. Once applied to the glass, using a straight edge and razor, cut away the excess backing material and leave only the desired lettering. I usually cut away the bottom excess material in a straight line. Doing this will enable me to evenly place lettering along a straight edge later. See **Photo B**.

With the front panel removed from the project, without knobs or jacks attached, use painter's masking tape to create a straight line for placement of lettering. Painter's tape is an adhesive-backed paper tape used for masking during painting and is easily removed without leaving a residue. Office "clear tape" and other tapes I have tried sometimes peel paint finish from the freshly painted panel. This can be very disconcerting. Painter's masking tape is available at most hardware or home improvement stores and is very inexpensive. This also provides a resting surface for your fingers that will protect the surface of the panel from scratches and contaminants.

With the tape in place providing a straight edge, pick the needed label up from the glass using the tip/point of a razor knife or tweezers. Moving them in this manner avoids placing unwanted fingerprints in the adhesive on the back

of the label. Carefully place the label where desired, ensuring that the edge of the label is parallel with the straight line provided by the painter's tape. When all labels to be placed along the line have been applied, remove the painter's tape. Rub down labels to ensure total adhesion and removal of air pockets, etc. Once all labels have been applied, carefully place knobs on the panel to prove to yourself that adequate clearance has been allowed and that lettering is aligned correctly, and that you haven't misspelled any words. See **Photo C**.

Once you're satisfied with your front panel, it can be clear-coated with clear spray, which will protect the lettering from wear and effectively make the clear backing disappear if you are using a clear tape method.

When creating your front panel, paint a scrap piece of the material with the paint you intend to use. Apply "practice" lettering to it, and then spray it with the clear coat you plan to use. Different types of sprays from different manufacturers are often not interchangeable. The resulting piece using the wrong products produces a slimy, wrinkled mess which is very disconcerting following all of your careful planning and work. I cannot over emphasize this careful selection of products prior to doing all this work.

The "masterpiece" you have labored lovingly over now has a more professional appearance, using materials easily available. The keys to a clean look are planning, patience, and care.

Good luck! And enjoy showing off your latest creation!

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NEVER SAY DIE

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What about the ARRL, you ask? The only belief I have in the League is that someone should wake up the gang sleeping at HQ and tell them to get their ass in gear and start promoting the hobby before it dies. Maybe you can energize your local director to do more than rubber stamp what the HQ gang asks for at the next board meeting.

Have you even a remote clue about how much the number of licensed amateurs has grown in the last five years? Make a guess? Wrong! It was 0.5%. Compare that to the 1946-1963 17-years of 11% per year growth — a five-year growth of 168%.

You know what I'd like to see? The ARRL do a survey of today's ham activity on the bands. They could get volunteers ... retired hams ... to do signal

counts on our HF bands once an hour 24/7 for a couple of months. Maybe from Washington, Southern California, Texas, Maine, and Florida. I'll bet they'll find that there are a lot less than 100,000 active U.S. hams on the HF bands. I'd like to be wrong, but never in my 64 years on the bands have I heard them so empty.

I'm going to keep hacking away at the public's belief in doctors, hospitals, and prescription drugs, using common sense and damned good research as my weapon. I'll leave it to you to either activate the League HQ gang or see our hobby blow away through your neglect. Every time you renew your ARRL membership you are making sure that HQ does nothing. That's the only vote you have.

Jet Lag

Pretty soon you'll be seeing jet lag

prevention glasses in the gadget catalogs. They'll have blue LEDs built in, powered by a 9V battery in your pocket. You wear them for three hours a day for two days before your trip and three hours during the trip. No jet lag.

I keep such weird hours at home that my body is never sure when to give me jet lag on trips to Europe or Asia. At home I go to bed when I get tired, whether it's 7 p.m. or 2 a.m. I sleep until I wake up, and take an hour nap during the day if I get tired. Works for me.

Health Notes

A daily banana helps ward off strokes. It's the potassium. Oranges help, too. Hmm. I eat a couple bananas and an orange for breakfast every day.

Optimists are healthier and live longer, according to a Mayo Clinic study.

Continued on page 41

Travels with Henryk — Part 9

The Dominican Republic, where the main mode is merengue.

The Dominican Republic (DR) is centrally located in the Caribbean Sea, sharing the island of Hispaniola with Haiti. Only recently, the DR became economically accessible from my part of the world, so one cold and dark December morning I jumped on the bandwagon and took a 12-hour nonstop flight from Stockholm, Sweden, to Puerto Plata, DR.

Puerto Plata is a medium-size town on the north coast, not far away from the place where Columbus landed in 1492. This place, Cabo Isabela, was the first target of my trial ride in a rental car. By the way, renting a car is inexpensive, but Scandinavian tourists are advised to avoid it because the majority of native drivers have no license. Yet, during my two weeks there I did not witness any road accident — which indicates that one does not have to hold a license to be an alert driver. It might be true in case of

ham radio operators, too, but all the HI hams I met proudly display their amateur radio tickets.

Driving back to Puerto Plata from Cabo Isabella, I suddenly saw a large shortwave yagi in the distance on the left side of the road and instinctively drove in that direction. It was Rafael HI3RF's impressive antenna. Rafael spent 20 years as the mayor of Puerto Plata. Now retired, will he devote more time to his on-air activity? (Photo A.)

He helped me to locate other hams

in this area and made a few calls, both on 2m FM and telephone. Without Rafael's help I would never have found Cosmo HI3CVV, who is very active on the bands, including 11m CB. Cosmo lives in a neglected suburb called San Marcos, but his home is very neat and he works at Teleferico — a cableway running to the mountain ridge just south of Puerto Plata. Cosmo has helped visiting hams to operate radio from the top. His son, named Cosmo

Continued on page 36

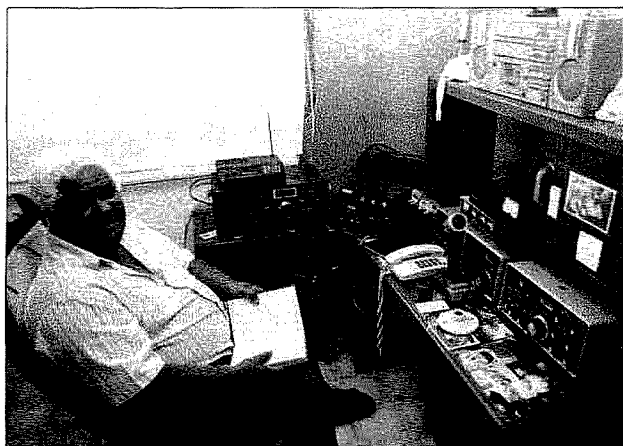


Photo A. Rafael HI3RF at his station in Puerto Plata.



Photo B. Cosmo HI3CVV and his son Cosmo, Jr., in the radio corner, Puerto Plata.



Photo C. Constantino HI3CCP sitting at one of his modern rigs, Edwin HI3NR behind him.

Travels with Henryk — Part 9

continued from page 35

Jr., is a bright student of computer science but is not interested in radio. **(Photo B.)**

Another day, passing through a wealthy precinct of Puerto Plata, I remembered another hint of Rafael's. I

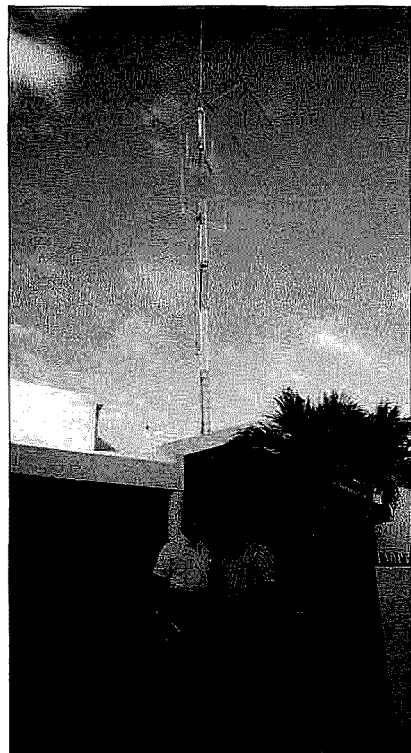


Photo D. HI3CCP's antenna.

found the street he had mentioned but could not see any amateur radio antenna. The street was deserted but a car pulled over just a few steps from where I was standing. Scanning for any aerial, I asked the driver if he knew any radioaficionado in this area. "I am," he answered. "My callsign is HI3NR." That was Edwin, who had come to visit his parents' home. The 3-element HF beam was waiting in the backyard to be relocated to Edwin's new house. Edwin acted as my liaison with local hams for the next few days.

He had lived in Florida for some years and is fluent in English. His Web page is at [www.qsl.net/hi3nr/].

One day we drove to Santiago through the picturesque Cordillera Septentrional. Santiago is the second largest city of the DR and the center of tobacco industry and is well represented on amateur radio bands. One person, Constantino HI3CCP, is responsible for a large amount of this activity **(Photos C and D)**. He patronizes a few repeaters around Santiago, supports the local club, is often on the air himself, and collects vintage radios. I was stunned by his collection of American-made receivers and transmitters from the '50s and '60s. I could only look at their pictures and dream about them from the time when I was a newcomer ham in Poland in the early '60s. Funny, at that time you could count active Dominican hams on the fingers of one hand, and possession of a radio receiver was forbidden here.

Other active hams in Santiago I managed to visit were Chuchu HI3JJS **(Photos E and F)** and Romeo HI3BRR **(Photo G)**, and the local radio club HI3JR, where, in spite of Christmas season, a few members turned up **(Photo H)**. A heated discussion took place here, concerning the use of our 2m band by the Civil Defense. It is quite common in countries with low

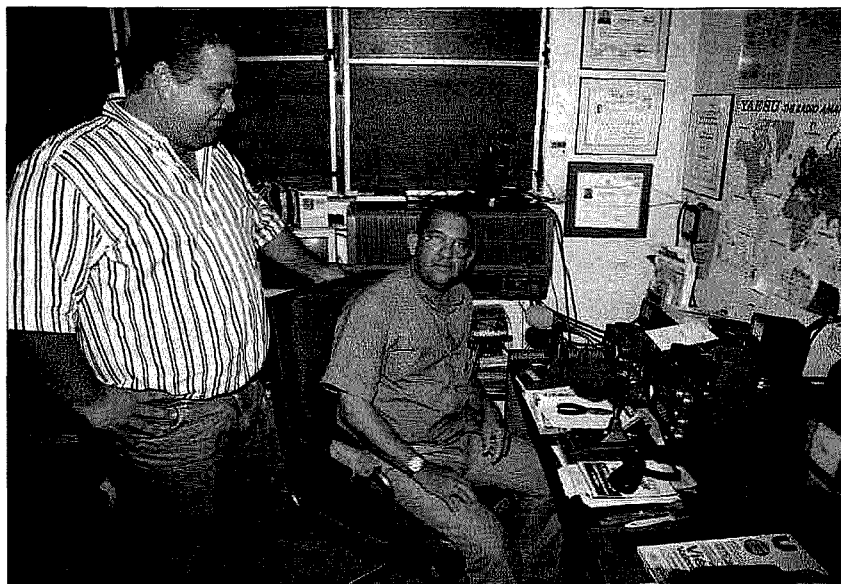


Photo E. Chuchu HI3JJS at the rig, Edwin HI3NR standing.

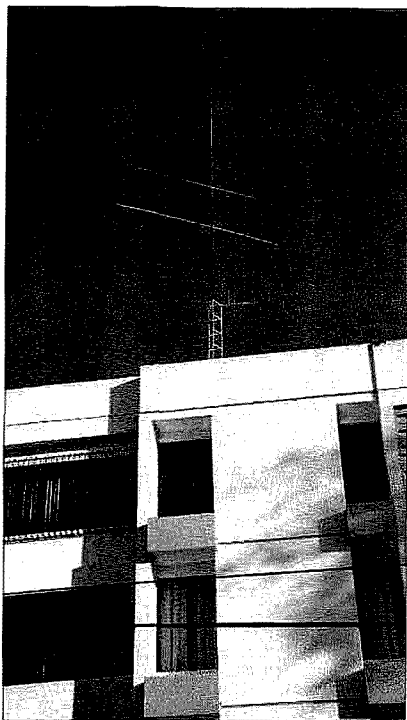


Photo F. HI3JJS's antenna.

amateur radio populations to find that cheap and easily available 2m FM radios are used by non-amateurs, but here the hams are numerous. Going back from Santiago through the town of Imbert, I stopped by to visit José HI3JBV, alias "El Arabe" (**Photo I**) on the 11m CB bands.

The licensing authority is, after restructuring, the Instituto Dominicano

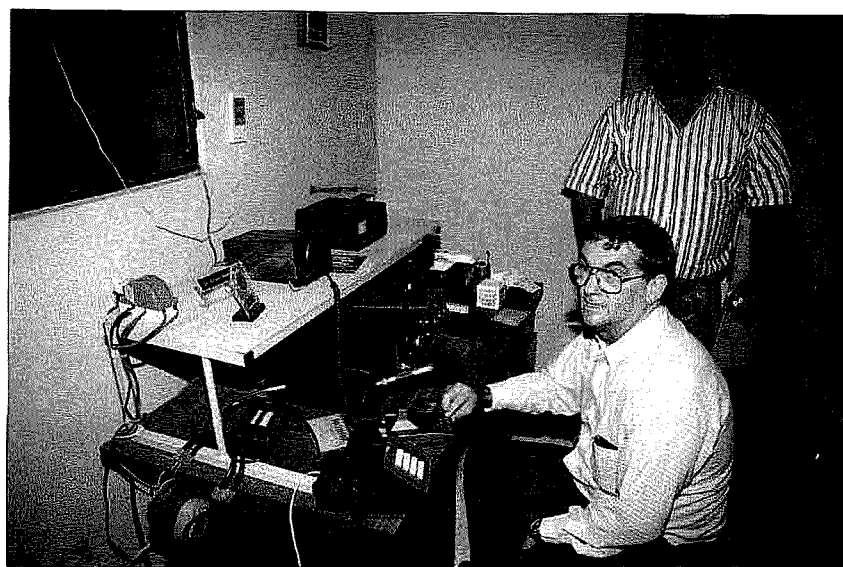


Photo G. Romeo HI3BRR at the microphone, Edwin HI3NR behind him.

de las Telecomunicaciones in Santo Domingo. A visitor's license is easy to obtain; however, power outages are common, so better hotels have their own generators. And a lot of people who can afford it have inverters supplying 110 VAC from 12 V batteries installed at home. Every ham I visited has a set of 12 V batteries as backup.

To a tourist, the country offers long, sandy beaches, caves and mountains, excellent fruit and fish, first-class tobacco, and delicious rum. It's warm

and humid here, people are friendly, and the merengue music is addictive.

I'll be back here, and will bring my radio next time. 73



Photo H. Radio Club of Santiago HI3JR. From left: HI3AP, HI3AW, HI3CCP, HI3FI, HI3NR.

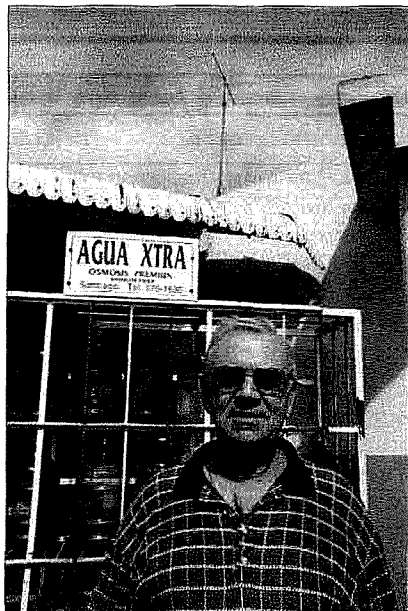


Photo I. José HI3JBV, "El Arabe," in the town of Imbert, between Puerto Plata and Santiago.

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2m FM Ham History 101

It's time you got your degree.

To know where we are going, it helps to know where we have been.

Here are three “lectures” that tell us a bit about our ham heritage, as well as give the origin of some of the conventions we may tend to overlook, ignore, or forget.

Why do we announce we are leaving the frequency?

Were you ever listening to the dead, empty repeater output frequency, when all of a sudden someone said, “W1blah-blahblah leaving the frequency” or “KB1yadayada clear”? Did you ever wonder why they announced they were no longer listening? Didn’t make much sense, eh? Here’s an explanation of why that person did it.

First, it is wrong to do so in amateur practice. However, it is proper in different services, but only in a historical context. Unless considered a one-way broadcast of general interest to amateurs, it is an announcement that the ham is not listening for responses nor conducting a test. Furthermore, it is impolite to tell everyone within listening range that you are not going to listen to them any longer!

But why was it OK to do so in different services? In the old days, the ’50s and ’60s, when commercial (business)

two-way radio was in its infancy, there were few radios and few frequencies available and in use in any geographic area. Consequently, frequencies were shared. The oil delivery company used the same frequency as taxis, fire departments, the automobile travel club’s trucks, municipal services, and so on. Since frequencies were shared, it was necessary to listen before talking to avoid interfering with another service’s transmissions. As frequencies were shared resources, people were careful not to interfere, or else they might be interfered with themselves. The Golden Rule applied.

It was more than a courtesy to announce that a series of transmissions was complete — it was a requirement. It was necessary to announce that a station was going out of service or off the air so that other listeners would know the frequency was available again and they could use it. Also, a dispatcher would know a truck, for example, was not going to be available for a call.

So what does this have to do with ham radio? In the early days of ham FM radio, using converted commercial equipment, the primary users were

hams who were two-way radio service people who knew how to put commercial gear on ham frequencies. These first adapters brought with them the practices they used in commercial services. Initially, “everyone” used 146.94 Mc — megacycles, now MHz — simplex. Repeaters were yet to come. This common frequency was a shared resource and it was necessary to use courtesy for all the same reasons the commercial services did. Therefore, the hams announced they were leaving or clearing the frequency.

And so, some of the next generation of hams copied the practice, and then the next generation, and so on and on. In ham radio, announcing that one is leaving or clearing the frequency is a practice that no longer makes sense, nor is it desirable or needed. But now you know why some people do it — it is a borrowed practice from long ago. It is just one vestigial trace of our heritage in the radio arts.

But that accounts for some of the single-frequency simplex activity that characterized early FM activity. The practice continued even when repeater operation became commonplace. But repeaters use two frequencies. How and why did that come to be?

Why do some repeaters shift up or down?

Until about the mid-1980s, Technician-class hams could only use two-meter band frequencies up to 147.00 MHz. Only General, Advanced, and Extra-class could go above 147.00. So, if a repeater used by the majority of users with Technician-class licenses used a frequency below 147.00, the repeater could only shift downward in frequency because the users could only transmit at the lower frequencies; those repeaters with outputs above 147.00 shifted up. (Some hams called them "exclusive" because those ops would not talk to Techs! The concept of exclusivity was disparaged by some and lauded by the rest.)

After the FCC rules changed, allowing Technicians to use the whole band, the exclusivity was lost and we now simply refer to the shift as up or down, positive or negative. In fact, we only have to know the repeater's output frequency to know whether the input is up or down in frequency, and by how much. For example, if a repeater uses an output of 146.70 (once a popular frequency for RTTY repeaters), we know that the input is 146.10. (146.70 is below 147.00, so the input is lower in frequency. Furthermore, it is 600 kHz lower. The same logic applies to repeaters operating in the 145 MHz range — 145 is below 147.0 MHz and is, therefore, a downward shift. There is no need to indicate the shift or its direction unless the repeater does not follow convention.

As a historical footnote, this was not always the case. In an effort to squeeze more repeaters into the available space of a given megahertz, there was a plan in effect in some areas of the country to use so-called interstitial splits. This meant that in an area where repeaters were spaced 30 kHz apart (146.64, 146.67, 146.70, and so forth) and used a downward shift, there would be room to insert repeaters on the intermediate frequencies and use an UPWARD shift (146.655, 146.865, 146.715 inputs with 146.055, 146.265, and 146.115 as outputs, respectively, and so forth). Why? Because ham receivers were not sufficiently selective to

separate signals as close as 146.64 and 146.655. Therefore, the plan called for the intermediate frequencies and inverted split directions. Thankfully, this idea did not gain widespread acceptance!

Why do we have 600-kHz repeater splits?

In the beginning of ham FM radio involvement in the 1950s, the only equipment available was from manufacturers such as Bendix (yes, the brake people), Aerotron (yes, the same people who brought Gonset to hams), Federal Signal (which made railroad equipment), and others such as Link, Carphone, and RCA. You might also have heard of Motorola and General Electric. The equipment was commercial and required conversion to ham frequencies. Most radios were wired only for single-frequency operation. You might get a working radio for free, but two crystals were required for each frequency (transmit and receive) and they cost \$5 to \$15 each. By informal agreement, all two-meter rigs (that is, converted high-band equipment) operated on 146.94 simplex. There were no repeaters at first. All communication was station-to-station. Rigs and antennas were optimized for that one frequency.

Eventually, repeaters were invented. Actually, they were put into use on ham frequencies, just like they were for commercial users. Physics and experimentation showed that repeater receivers at sites where the transmitter and receiver were at the same location suffered less desensitization if the transmit and receive frequencies were far apart. Ham repeaters used various separations, but that meant that a tuned antenna or tuned receiver front end had to be adjusted quite differently from the tuned antenna for a transmitter.

What to do to ensure peak performance? Practically, it was discovered that a split of 600 kHz was about as far apart as you could separate a transmitter and receiver in frequency to enable a single antenna tuning network to work well for both functions. Of course, the antenna would be tuned for a midpoint frequency, and that opened a bit more of the band for other repeater

frequencies to be within tuning range with minimal compromise.

But it wasn't always that way! The concept of 600 kHz splits was not intuitive. It required repeater owners be convinced they should conform to this radical idea. That is, repeater owners and operators had to be convinced that they should spend money to buy more crystals and tune antennas just for conformity to a concept that meant nothing to them locally, especially when the repeater was coming in just fine, thank you.

Now, aside from the practicalities of allowing as many repeaters in the available frequency allocation, this was the tightest frequency split that would work. As repeaters' ranges extended, it became necessary for repeater users and owners to adopt a wider set of principles. (There were overlapping super-repeaters everywhere. You could use a walkie-talkie in downtown Boston and talk to hams in Albany!) The big picture became more important than local concerns and needs. A national norm was needed, developed, and adopted. That norm was 600 kHz.

True history ... a practical example of local cooperation

In New England in the early 1970s, we had three major repeaters, each of which gave line coverage that overlapped in Boston and its northwestern suburbs. The Concord, NH, repeater had an output on 146.94 and an input of 146.31: a 31-94 repeater. Waltham, MA, repeater's output was 146.64, input 146.34: it was set on 34-64. (It had less than a 600 kHz split because its receiver and transmitter antennas were separate and far apart.) Mt. Greylock, in North Adams, MA, had an output of 146.91, input 146.04: set for 04-91. As you see, none used 600 kHz splits. Each repeater trustee was reluctant to change because of their expense and the expense of their users to buy new crystals.

But reason prevailed. One fateful day around 1973, the repeaters realigned to 600 kHz splits. Users in each area voluntarily swapped crystals (some met

Continued on page 56

To the Rescue

A story about 2m and winches — we hope.

This is a little tale about how a car and two tow trucks got stuck in the mud, and how it took a search-and-rescue member to save the day.

I hadn't been a ham radio operator for all that long of a time, but I was more than happy to have access to an autopatch — I had no cell phone. But who really needs a cell phone when you have the ability to talk on 2 meters?

This is how it happened

It was a cool fall evening, about five o'clock on a Saturday. Dad and I decided it would be a good time to fly our remote control gliders. Because we are both hams (dad is KE6FBN), he and I have the privilege of using a special band just for us licensed radio operators. We headed out to the model aircraft field just south of Ukiah.

As we made our way to the airfield, we monitored one of the 2-meter repeaters. Not too many people were talking, but we always liked listening anyway.

After Dad and I put in a few hours of flying our gliders, we decided to pack up and make our way home.

That's when the trouble began. When I tried to back the car out of the mucky place where I had parked, all the tires would do was spin. Dad got out to check on the situation. He saw some wood next to the road so he decided to

place the wood under the spinning wheels — it was useless. And what was the point to keep on trying?

"Call Mom and tell her we need a tow truck," Dad told me.

I grabbed the mike and dialed in for an autopatch.

"Juliet is dialing the phone," the repeater said.

The phone rang and mom answered. Thank goodness I didn't get the answering machine.

"Mom," I said, "we need a tow truck, we are stuck in some mud." I had little time to say much else before the autopatch went dead. Luckily, Mom got all the information we needed to be saved from that muck. The tow truck was on its way.

I walked down to the end of the muddy road. A few minutes later the tow truck arrived. I flagged him down, jumped into his truck, and we started on the way back to my car.

"Do you have four-wheel drive on this thing?" I asked the young man.

"No, are you kidding?" he answered. I had a *bad* feeling about this ...

Then a somewhat funny thing happened — the tow truck got stuck in the mud. The tow truck driver went right

when he should have gone left. His tires were spinning, but nothing else was happening. He got out of his truck and tied his winch to a nearby tree. He turned the winch on and pulled his truck off to the side of the road. Obviously, his situation was made worse.

"Say again?" the dispatcher said.

"Yeah, that's right! I need another tow truck because I am now stuck, too," the driver said.

I guess I should have warned the driver of that tow truck, but he is supposed to be a pro.

At about that time, our friend Blair Mitchell K6CPY called my dad on the two-meter repeater.

"What's going on, Al?" K6CPY asked.

"Well, Blair, we got stuck in the mud out here at the airfield. The tow truck got stuck, too, so they are sending another tow truck."

A search-and-rescue worker was monitoring the same repeater. He called out to my dad, "Do you need some help? I have a heavy-duty truck and can pull you out."

"Thanks!" Dad said.

Continued on page 56

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the April issue, we should receive it by January 31. Provide a clear, concise summary of the essential details about your Calendar Event.

JAN 11

GREENWOOD, SC The Greenwood ARS 2003 Hamfest will be held at Greenwood Civic Center, January 11th, 2003. Contact *W4JAK*, President, GARS, 106 Dorchester Dr., Greenwood SC 29646, for further information.

JAN 25

LOCKPORT, NY The Lockport ARA Inc. will host a Hamfest/Auction on Saturday, January 25th, at the South Lockport Firehall, Transit Rd. (RT. 78), corner of Ruhlman Rd. in Lockport NY. Talk-in on 146.820 PL 107.2. Setup for vendors is at 6 a.m. The hamfest is open to the public at 7 a.m.; auction starts at 11 a.m. Admission \$5. 8 ft. tables \$5 each. Refreshments available. Contact *Duane Robinson W2DLR*, P.O. Box 142, Ransomville NY 14131. Phone 716-791-4096; E-mail [W2DLRHAM@AOL.COM]. Please visit the Web site at [http://lara.hamgate.net].

JAN 26


NEW PHILADELPHIA, OH The Tusco ARC Hamfest will be held at New Towne Mall, 400 Mill Ave. SE, New Philadelphia OH, Sunday,

January 26th, 8 a.m. to 2:30 p.m. Setup is at 6 a.m. Admission is a \$4 donation at the door, dealers admitted at no charge. Tables \$11 each. Food will be available on site and starting at 7 a.m. at the restaurant next door. Directions: Exit 81 off I-77 to SR 250 East to SR 416 Exit. At end of ramp, turn left at light (under SR 250 bridge), then turn right at the first light. New Towne Mall is on the left. Talk-in on 146.730(-). Free parking available at the mall. Dealers welcome. ARRL/VEC sponsored exams by appointment. For additional info and to reserve tables, contact *Gary Green KB8WFN*, 32210 Norris Rd., Tippecanoe OH 44699. Phone 740-922-4454; or E-mail [kb8wfn@tusco.net]. Reservations must be paid in advance and received by January 20th to insure the return of reservation confirmation. Remember to enclose an SASE. Make checks payable to Tusco Amateur Radio Club.

ST. CHARLES, IL The Wheaton Community Radio Amateurs' Midwinter Hamfest will be held at Kane County Fairgrounds, 525 S. Randall Rd., St. Charles IL, 8 a.m. to 1 p.m. on January 26th. Talk-in on 145.390. Heated indoor flea market tables and commercial booths. Free parking. Hourly prize drawings

with a grand prize of \$500. VE exams. Tickets \$6 in advance with four door prize stubs, \$8 at the door with one door prize stub. Contact *WCRA*, P.O. Box QSL, Wheaton IL 60189. E-mail [info@wheatonhamfest.org], or phone 630-604-0157. Visit [http://www.wheatonhamfest.org].

FEB 9

MANSFIELD, OH The Mansfield Mid-Winter Hamfest/Computer Show will be held Sunday, February 9th, at the Richland County Fairgrounds, Mansfield OH. Plenty of prizes and an over 400-table flea market in three large modern heated buildings. Doors open to the public at 6:30 a.m. Tickets \$5 in advance and \$6 at the door. Tables \$12. Talk-in on 146.34/.94 W8WE. Advance ticket/table orders must be received and paid by February 1st. Send SASE to *Dean Wrasse KB9MG*, 1094 Beal Rd., Mansfield OH 44905; or call 419-522-9893 and leave a message for a return call. Info is also available at [www.MASER.org]. There will be a League Night banquet the night before the hamfest. More info on the banquet will be available on the Web site, or call *Bill Martin N8TQ* at 419-526-4661. 

NEVER SAY DIE

continued from page 34

People who don't get enough sleep have double the heart attack risk. Angry and depressed people are also more likely to have heart attacks.

Super germs have escaped! The widespread overuse of antibiotics has resulted in the breeding of drug-resistant germs. These are now escaping from hospitals on the clothes of patients, workers, and visitors. Germs used to quickly die after exposure to the outside world, but the new resistant germs are able to stay alive, even for months, waiting for a new host to attack.

There's much to be said for keeping your immune system at industrial strength, plus a supply of silver colloid on hand. Just in case.

The Staph of Death

D'ja see the five-page article in *Fortune*

on the latest *Staphylococcus* mutation? Infections by this mutant staph are now routine in hospitals. This is a nightmare that doctors have been dreading (and expecting) for years.

Several years ago I reviewed the wonderfully documented 750-page book by Eileen Garrett, *The Coming Plague*.

According to the CDC, of the ten million patients who entered hospitals in 1999, two million caught bacterial or viral infections, and over 90,000 died of them. This makes hospital infections the number 5 killer in the U.S.

The research looking for a cure for staph is being done by the pharmaceutical companies. Are they checking out silver colloid? Of course not. That's not an option since it can't be patented and sold in \$20 a day doses.

In the meanwhile, perhaps you'd do well to do everything in your power to stay the hell out of hospitals ... where, if the staph of death doesn't get you, a

surgeon's oops, prescription error, or some other hospital-gained infection may. The *Archives of Internal Medicine* published a study in September tracking drug use in 36 hospitals and nursing homes in Colorado and Georgia. The report showed that in the average 300-patient institution an error was involved in one out of five cases. Seven percent of the errors were "really, really bad." That's more than 40 really bad errors per day.

Russia Today

What's happened to the "other" superpower? Today Russia has a GDP smaller than California's. Its birthrates and adult life expectancy are declining, so much so that by 2050 it could have fewer people than Iran.

Maybe you've noticed that while a lot of

Continued on page 58

Vive la France!

Do you suppose if the French can build the highly successful Concorde SST airplane, would it be safe to bet one of those folks could write a good PSK31 program? Well, one of them did and has not said much about it. So here it is for you to observe and enjoy.

This is another program written utilizing the AE4JY PSK engine, with the author's (F6GQK) own innovations and preferences built-in. I must say, right to begin, this is an intuitive program to use that will not disappoint the casual user, and the more you use it the more you find it may just cover your needs — plus, of course, the price is right: free!

I happened on this software at Dave's (G3VFP) Web site as I was searching for something new for your reviewing pleasure. There are several pieces of software that haven't gotten a lot of play in this column due to conflicts with some of the installed TSR programs. Those are good pieces of work but I like to work with stuff that downloads, installs, and plays which is exactly what DXPSK does. My favorite kind of program to talk about.

Funny I should say that, as I think about it, because on the very first contact with this program someone was asking for help with MixW2 over the air. So I never got to tell what fun I was having with this software. (Funny to me, you had to be there.)

Back to the setup. It is simple enough. You notice something right away. There are no pull-down menus across the top of the display. Instead, there is a row of icons on the left side with "Tool-tips" that tell you what the icon stands for when you touch it with your cursor. One of those says "General setup" when you touch it.

Naturally, there is a box where you can insert your callsign and choices for your PTT port and pin along with a few other available choices you can make at the time or get back to later. Three or four choices and you are in business.

The next thing I noticed was that there was no activity in the waterfall. The rig was on and the cables in place, so before checking

for something broken, I checked those icons again and the uppermost icon suggested "Connect soundcard." I clicked it and the waterfall began to play. Now we were getting somewhere.

Did I neglect to mention that I did not make the proper effort to download and install a Help File? This software is intuitive enough that even I can get it going without crutches — okay, up to a point anyway. Later, however, I found the Help File residing nicely in the DXPSK folder and double-clicked it and got the Help displaying just fine. Still later, I clicked the Help icon and it worked just like one would expect. Goofy Windows!

There followed a number of pleasant surprises. First, I took the time to write a few macros. One might look at these and say, "They are a bit different from the 'norm' or the way we are used to writing our macros," but as soon as you get into it after clicking the "Create/edit a macro" icon you will find that this system is also very intuitive.

You have the capability of 20 macros. I quickly wrote seven, one of which I duplicated due to being too quick, and that was almost the extent of my preparation. I added a few more that do not show in the screenshot after I determined there were no hot keys for transmit and receive. A review of the macro commands revealed it was simple enough to assign macros to perform those functions.

There was one more step. I attempt to have a log handy that will tell me of previous QSOs when I enter a callsign. DXPSK has a very good log system built-in, but it is not that sophisticated. My quickest solution I could think of was to get the Logger database up-to-date and run it with the DXPSK program. It worked as you can see. There was one little hitch. I found no way to keep

DXPSK from sneaking into the background when I accessed Logger.

Use the Task Bar

This merely meant I had to click the DXPSK button on the Task Bar to reawaken its panel on the monitor so I could see what was happening and control/participate in a QSO. You will see the advantage in the screenshot. I happened across a familiar callsign and double-clicked it so it was in the call cell in DXPSK, then entered it in the Logger entry panel which showed the previous QSOs in another pane. There is no connection between these two programs, but I like this info available so it is worth the effort to me.

One of the neat features you will discover right away is that changing receive panes is as intuitive as it gets. When you place the cursor on the waterfall a tool-tip pops up to remind you that left click is Frequency 1 (upper receive pane) and right click is Frequency 2 (lower pane). The marker is numbered and everything associated is color-coded. You soon have your brain thinking upper is green and lower is yellow and you can look to see what is that color and you know what trace, frequency, report, and text belongs to whomever.

Plus, when you click with one or the other mouse keys in the waterfall, the Channel 1 or Channel 2 tab is actuated for you so that all the figures apply immediately. Of course you can click on either of those tabs to make the change from one Channel to the other with your mouse. Just as good as I could have ordered it.

You will notice more hidden features as you use this program. I had already successfully had two QSOs when I got to looking during a lurking session that the transmit and receive frequencies were way different

as displayed. A quick experiment showed the transmit frequency to immediately jump to the receive frequency when going into transmit mode.

One of the minor aggravations when working with a program for a short time is logging those test QSOs with pencil and pad to be transferred later. This program has the answer in place. No pencil needed. There are two little icons just below the Call and Name boxes. One of those is to delete or clear the entries in those boxes. The other starts you into a log dialog which, when you finish, produces an adequate ADIF log within the DXPSK folder. You can import it directly into whatever popular log you are using, no conversions needed. Just do it.

All-in-all, this program is well thought out. You can see that the programmer customized features to fit his own tastes and these qualities result in a package that is very easy to get acquainted with. So be careful, in just an hour or so you could get hooked on some of the unique ideas.

Another special application

While nosing about recently, I ran across a handy little program that I did not know existed when I wrote the November article on the early PSK31/PSKGNR software combo. I mentioned that PSKGNR would write a log file, but there was no other log facility available. I was not quite correct.

There is a program named PSKlog, by Cristi YO3FFF, that is meant to fill that need. I downloaded it and it is shown running in a cropped screenshot (Fig. 2) along with the other two programs. I found that my computer had a conflict of interest with this little program having to do with one or more of the TSR programs.

However, the program is available and is likely to work on your nice "clean" machines that aren't cluttered with all these toys. Just wanted to let you know I stand corrected on my statement about log programs for this setup. It exists and is listed in *The Chart* on the Web. Plus, you will see it is a serious log effort as you read the info on his Web page. Incidentally, as I looked on the YO3FFF Web site, I found there were updates available that could relieve my problems. Only hitch was the download didn't work, so it became too late to experiment this month.

DXAtlas software

Another area of interest for some of you is a program called DXAtlas. This has been available for some time and has been upgraded since I reviewed it a year or so

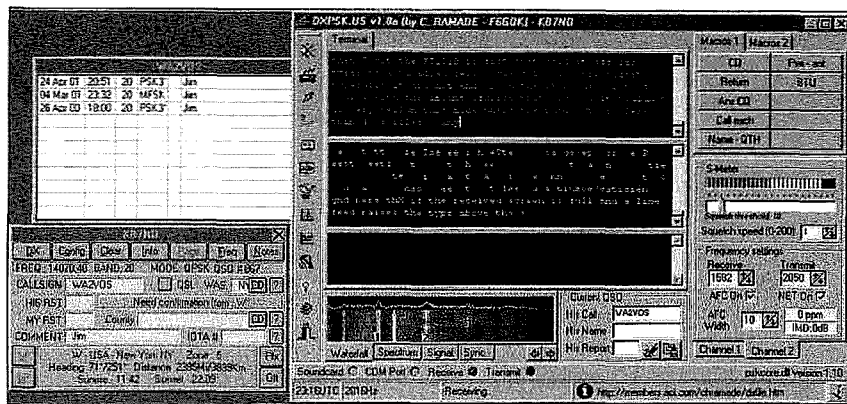


Fig. 1. DXPSK in action. Monitoring two signals at once. You may recognize the Logger panes to the left. The programs do not talk to each other. It is simply that invariably, when I test a new program, I will contact a call I should recognize and it is hard to explain why I "don't keep records." The value is obvious as I entered a callsign in the log and 3 previous QSOs came up. The important part is the intuitiveness of DXPSK. The macros are simple to write. The color coding of the 1st and 2nd channels make it a snap to tell which station you are copying. The width of the waterfall is adjustable quickly from setup. The icons on the left are in lieu of pull-down menus. When you click on them, as well as most other places in the display, "tool-tips" gives you a description of their function. A very nice piece of work that includes limited but adequate log capabilities. (See text.) And it is a free download!

ago. Since all the changes in the shack computer, I had not reinstalled it. Recently I noticed some discussion on the MixW reflector concerning a macro to bring it up from within the MixW program.

That motivated me to reinstall this clever piece of software and get it accepting information from the MixW 2.06 program, which it does exceptionally well. It is a lot of fun to use besides being very useful and, to me at least, educational as well. Lots of things you can discover about geography when you click a world atlas into full screen mode for a bit. Just for a challenge, try finding the exact opposite spot on the other side of the world from where you are sitting. It can be done using this software.

One thing I discovered as a little aside as I attempted to get the macro described in the somewhat dated MixW Help File to work was a minor flaw in the macro language. Here was another learning moment.

I copied and pasted the macro language from the Help File to the MixW macro, closed the macro edit screen and clicked on it. It did not work. After a quick look, I realized there is some version of the Windows operating system, in use, I assume in other parts of the world that does not have a folder named "Program Files" but rather "Programmer."

The described macro contained Programmer in the path to open the files and all that was necessary was to change that to

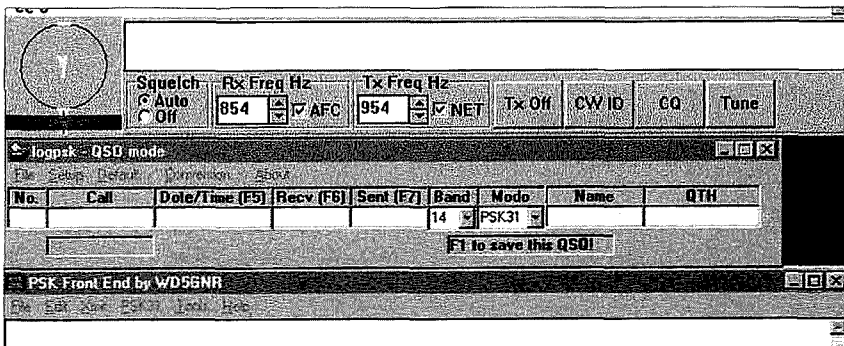


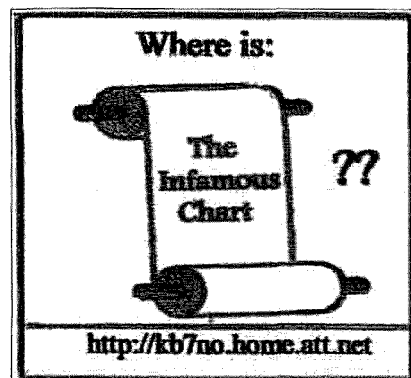
Fig. 2. This is the log software from Cristi YO3FFF, that works with the PSKGNR software mentioned in the November column. I mistakenly mentioned there was no log function included, but here it is. It appears to be an ambitious effort to develop a comprehensive log program. See text and Web site.



Fig. 3. DXAtlas is displaying my QTH in Nevada and a station in Montserrat with data supplied by MixW. I usually like to use the rectangular display when I go to full screen just because it seems traditional. Works either way. The longitude and latitude figures are displayed in the partially hidden MixW2DXAtlas pane at the lower right. If my CD gave those figures for the other station they would also be shown. See text for a macro fix needed to bring up this program from within MixW. A new twist for me. The DXAtlas is a fine shareware program with many features and will run standalone. There are upgrades available on the Web site listed in The Chart.

Program Files and Presto, the macro worked fine. So, for my English-as-a-first-language Windows-using friends, there is another one of those bits of trivia that will help you through life. Someone will probably send me a note on this and I will learn where "Programmer" is the norm as a Windows operating system folder.

For those who are wondering where to get info for downloading the little program



(MixW2DXAtlas) and related items, go to the MixW home page, click on "Addendum" and follow the path, "Exporting to map programs." DXAtlas is a standalone program that does not have to be run with MixW. Therefore you can download it from the URL listed in *The Chart* on my Web site.

New antenna thoughts

I have had two on-air discussions with Jack WØKPH in Colorado, concerning a novel limited-space antenna design project that appears to work very well. From what I can see, this is not an entirely new concept. I have seen antenna design theory that backs up what is being done here, but this is the only extensive effort

I have seen where the theory is implemented into a working model that is proving to be a viable answer to many hams' dilemma caused by the restrictions imposed on antennas in urban U.S. cities.

The design lends itself well to mounting almost inconspicuously on a backyard deck and when I have worked the owner of this tiny array the signal reports in both directions were in the S9 category. It is worth a look and, if you are like me, you may be spurred to do a little experimenting. My brief exposure to this project and the signal reports are very motivating. This is also listed in *The Chart* on the Web. The URL is [<http://www.qsl.net/w0kph/>].

News item revelations

In the past several months I have run across a few news items that may be of interest to more than just myself. I know there are readers of this column who are very knowledgeable concerning Linux because when I mention my inadequacies concerning

attempts to get that system up and running, I usually get a few notes of encouragement.

So, briefly, the first news item concerned the announcement of an operating system that would allow the use of both Windows software and Linux applications. "Hmm?" says I, "I will check into that." I looked briefly and it was, as of some months ago, an underdevelopment process that allowed us to participate with the authors for around a \$100 investment. The name of the system is Lindows. I didn't feel the need to contribute, so the idea was relegated to the bottom of the think tank pile here.

The second, more recent, news item concerned a seemingly strange mention of a computer for sale from Wal-Mart, of all places, for \$200 with Lindows installed. That got my attention. It was only available from the retailer via their on-line storefront.

At this time, I have it on order. The producer of this equipment has a brand name of Microtel. I went to their Web site where they describe several computers but refer you to Wal-Mart on-line for specifics. Strange indeed, but they admit to an existence, which is a bit more substantial than some back-porch computer assemblers I have dealt with in years past.

One thing in the computer's favor is that it has enough processor speed (800 MHz) to handle whatever should be necessary. On the downside, the motherboard seems a bit deficient in available slots (1). But what can I ask for at such a price?

We shall see what comes of this adventure. By the time you read this, I will either have gotten this up and running and doing semi-great things with it or will have learned another lesson. In any event, there will be a page on the Web in *The Chart* concerning my findings, good or bad. It is one of those peculiar things to me that so little has come to my attention on this matter other than through a few relatively obscure news items.

One last thought and then I will be done for the month. I have noticed an apparent decline in the use of eQSL.cc cards of late. I wonder if it is the same with others. The site is a bit intimidating at first, but even I eventually figured it out. It seems most hams are sending hard copy cards these days. I don't care either way. It just looks like a trend is ebbing away. It is especially nice to exchange QSLs with foreign stations.

So much for what is happening lately. It is fun to hear from you and know how involved you are in these strange modes. Keep up the good work. 73 for now. Jack KB7NO — [KB7NO@att.net].

SGC STEALTH Antenna

One of the challenges in a disaster situation may involve getting an HF station on the air quickly and easily. The radio and the power supply are relatively straightforward, but the antenna is often a problem. Enter the SGC STEALTH antenna as a viable answer to this problem.

In the past we've discussed various approaches to antennas that can be used for HF applications, but most of these were variations on antennas designed for fixed operations and adapted for emergency work. As such, they are less than optimal versions of a design with reduced operational utility. On the other hand, SGC has designed its STEALTH antenna specifically to be a rapidly deployed, no hassle, easily used antenna.

In one small box are all the pieces needed to erect a loop antenna under virtually any circumstances. There is the 80-foot wire to be used for the antenna itself, nylon ropes with insulated clips for suspending it and the antenna tuner. There are also two manuals — one for the STEALTH configuration and one for the Smartuner. The wire and ropes are wound around reusable forms so that the materials can be easily accessed, and after use the entire unit can easily be returned to the same box for storage.

The heart of the STEALTH antenna is the SG-237 Smartuner. The Smartuner is a self-contained antenna tuner that requires only four connections. There is the PL-259 coaxial connection to the radio, a 12 volt power supply, and, for the STEALTH configuration, both ends of the loop antenna. The Smartuner has been a well-proven antenna coupler for long wire antennas. In general use, the antenna is connected to one side of the Smartuner and a ground to the other. By using loop configuration, the ground is replaced by the other end of the antenna wire. Electrically this works well, and from a mechanical standpoint, a loop also makes sense because a wire in a loop can be easily supported.

The SG-237 is essentially a custom-designed microcomputer with a Pi & L tuning system. Whenever the system senses forward RF power, the system activates and the software tunes to the new frequency.

Once a frequency is tuned, the SG-237 stores the solution for that frequency and tries that solution first. Because of this technology, it can tune a wire antenna from 1.8–60 MHz and handle up to 100 watts PEP at a 40% duty cycle for most modes. This would mean that a maximum of 40% of the time would be spent transmitting. Basically, keying the microphone is the only action required by the operator, the Smartuner does the rest. It is durably mounted in a waterproof case, and in some configurations is mounted by suspending it with the antenna. This is fine for emergency operations, but for long-term exposure to the elements some additional protection should be provided. This can be as simple as a plastic bucket mounted over the Smartuner.

As would be the case for emergency operations, I erected the antenna using available

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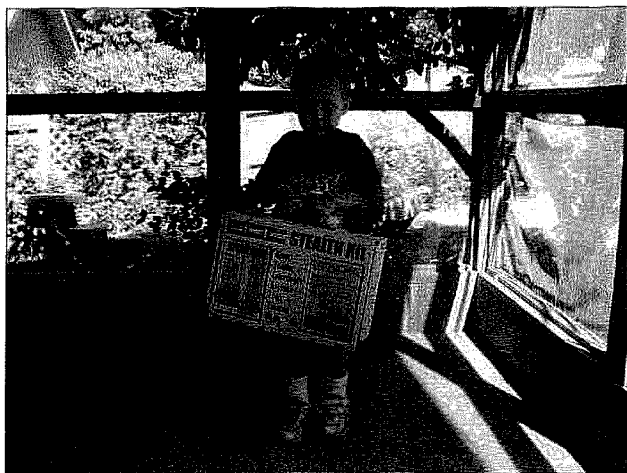


Photo A. The SGC STEALTH antenna is lightweight and comes in a cardboard case that can become an easy addition to your "Grab & Go" emergency gear.

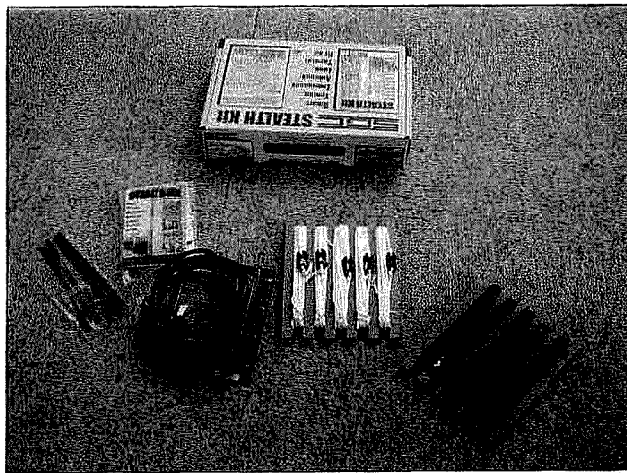


Photo B. The kit contains 80 feet of wire, nylon lines with insulated clips, reusable cable ties, the Smartuner, and manuals. Add a radio and 13.8 volts DC, and you're on the air.

The Hunt

It was supposed to be a bear hunt in the wilds of New Mexico. In October of 2002 Mike WA5TWT and I headed for the Pecos Wilderness via Albuquerque and Santa Fe. Bill WA5VQH was our host and provided transportation as far as wheeled vehicles could go. We had everything needed for hiking and hunting in the mountains, plus a few radios that couldn't be left behind.

It's a lot cooler at 9,000 feet in the Pecos Wilderness than at sea level in Houston, Texas. Mike and I thought we were ready for the change to near-freezing temperatures at night and high altitudes, but it was a shock. When it freezes in Houston, you make sure that the kids go outside to see frozen things, because it's so rare. Here it looked more like the norm.

There's no air above 9,000 feet. Our first foray into the hills was just after dusk on the first day. Mike and I were having trouble with anything that even looked like it might be uphill. All of the air is down on the coast. How do people live up here? We doubted if it was possible, and to prove it, I pointed out that we hadn't seen anyone since we had left a small town many miles earlier. Just to complicate matters the temperature was dropping rapidly.

After what Bill called a light evening walk, Mike and I were ready for heat and

some sleep. Bill's comment about getting up at 4:30 a.m. and heading back up the mountain to hunt for bear was vetoed. Maybe later, much later.

Our first full day was to be a scouting trip on horseback. Unfortunately the outfitter with the horses had backed out (probably ran out of air), so Bill suggested we simply walk to Grass Mountain. He said it wouldn't take long, and we could have lunch and a great view when we got to the top. Several hours later Mike and I collapsed on the summit of Grass Mountain. Fortunately we hadn't seen any sign of bear. We weren't interested. Finding air and keeping hydrated were our only thoughts. My pack seemed too heavy, but then again anything would have seemed heavy at this point.

Backpacking

The first time out backpacking you take too much. I learned this a long time ago

while hiking in the mountains in northern Iran. I had many pounds of gear that were not necessary, and I paid for it. If you don't need it, don't take it. While preparing for the trip to New Mexico I consulted my old Boy Scout handbook and an excellent Web site, [<http://www.backpacking.net>]. Between the two information sources I gathered the lightest equipment I could find. I had hoped to carry enough radios to work several satellites, but opted for low weight. I found that a very simple yet effective FM-only station suitable for contacts via UoSAT-OSCAR-14 (UO-14) with an uplink on 145.975 MHz and downlink on 435.070 MHz, could be packed into a 10.5" x 5" bank money bag. These bags are usually found at ham swapmeets and other surplus outlets. They are light, strong and provide enough padding to protect their contents.



Photo A. Andy W5ACM making satellite contacts from the top of Grass Mountain in the Pecos Wilderness.

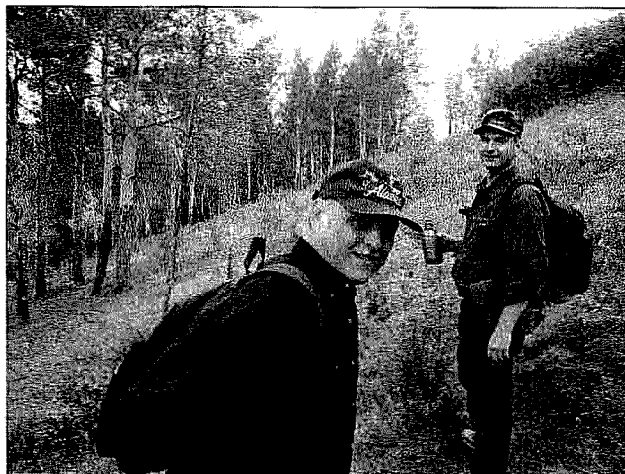


Photo B. Mike WA5TWT and Bill WA5VQH head up yet another hill.



Photo C. No bears, just paper targets and satellites for this hunt.



Photo D. A 10.5" x 5" bank money bag held all of the satellite gear.

The portable station

My complete portable station weighs the same as a typical MRE (Meal Ready-to-Eat) in the bag with chemical warmer, about one pound, 10 ounces. I know because MREs were the only food provided by our host while out on the trail. I don't like MREs anymore. All of my satellite gear was carefully chosen for light weight and usefulness. Compromises were made, but it's the results that count. There were no experiments on this trip, just sturdy, tested gear.

My radio of choice was an Alinco DJ-580T dual-band HT. It's not the newest, smallest or lightest HT for the job, but I have made many satellite contacts with it. My longtime familiarity with its simple controls, the five-watt output and full-duplex capability made it my rig of choice. Always practice at home with the radio you intend to take to the field. For power I took my highest-capacity, highest-voltage battery pack even though it added weight.

Although I prefer the Arrow dual-band yagi for portable operation, its size, and the inconvenience of putting it together and taking it apart on the trail made it a base-camp-only accessory. After trying several long "duck" antennas, I chose the Pryme AL-800 telescoping whip (\$30). When collapsed it measures only 9.5 inches. When extended it has 3.2 dB gain on two meters, 5.6 dB on 70 cm, and measures an impressive 34 inches. It is also quite rigid. This helps when attempting to find the optimum orientation during a satellite pass.

When working a satellite with a full-duplex HT, an earphone is needed to avoid feedback. When you are constantly adjusting the HT with attached antenna for best up and down signal levels, a headset with microphone is best. An effective but cost-effective choice is the MFJ-293 (\$25) earbud with boom microphone. There are

three models, for Kenwood, Icom, and Yaesu HTs. I used the Icom version with my older Alinco radio. The MFJ-293 is extremely light and small. It fits anywhere and is surprisingly durable.

While on cruise ships I track the satellites with a Palm-VII from 3Com. An attached GPS receiver provides my location and simple Palm satellite tracking software does the rest. This time I knew my target location within 10 miles. I plotted orbits for the general hunt area (grid DM75et) and printed them to paper. It's a good idea to test your predictions before heading out. Errors are easy to make when plotting orbits for a site other than home. Incorrect location data or a bad time zone choice can make a printed page of data useless. I use InstantTrack (\$30 for AMSAT members) from AMSAT [<http://www.amsat.org>] for my orbit predictions, and I carry a good pen to write down QSO information on the printed orbit prediction pages.

Unless you take along a GPS receiver

with integral compass, carry a standard compass with your portable station. When not moving, a typical GPS receiver cannot tell direction. Knowing your orientation is helpful when following a satellite even though you will be constantly moving the HT with antenna during a pass.

The final addition to my money-bag station was a Petzl Tikka headlamp. I had never seen one before this New Mexico outing. Bill WA5VQH uses one for nighttime outings in the woods. Unlike older units that use heavy batteries and incandescent bulbs, the Tikka has three high-output white LEDs running on three AAA batteries. The operating time is amazing. It will run at full brilliance for 12 hours, and at limited light output for up to 150 hours. I was hooked, but Bill kept a sharp eye on his Tikka. I had to buy my own from an online backpack-supply store for \$30. With it in place at night I could easily look at the radio

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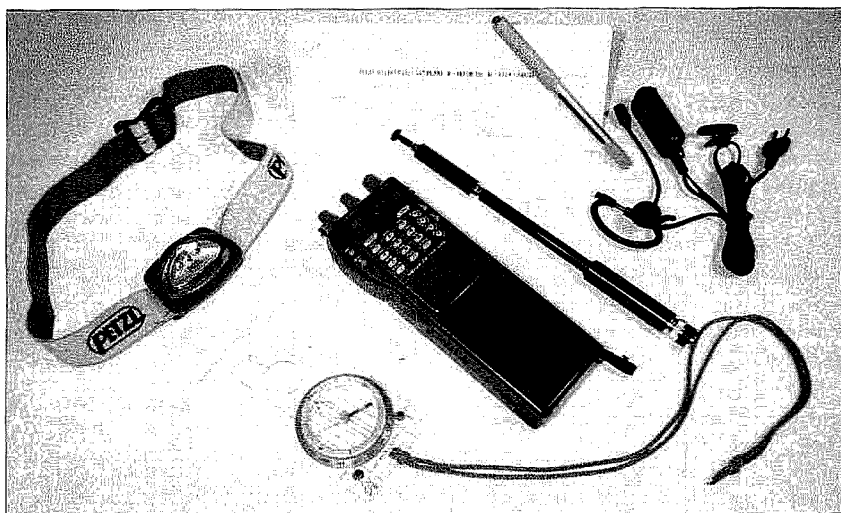


Photo E. A complete satellite station fits in the money bag.

A Simple Optical Test Device for the Laser/LED Communicator

In June 2000, I published in 73 Magazine the first of three articles about an LED communicator constructed in two sections of PVC tubing or pipe looking much like a binocular with a rifle scope for pointing the system.

The basic concept was to make a light communication system different from other devices for optical communications due to the difficulty in modulating HeNe lasers and safety concerns. Kerry N6IZW, my partner, developed the concept and system designs.

What was envisioned was a high-output LED transmitter and photo detector, each housed in one section of the 4-inch PVC pipe. Rear splice unions (PVC) and end caps were used to house electronics for the system. Not wishing to re-invent the wheel, existing systems were used so we did not have to construct a full receiver system. What was done was to use a 4046 IC oscillator functioning at 35 kHz on one end and 45 kHz on the opposite end so as not to feed back to its own system. The modulation and RF driver for the LED is a 324 op amp and an electret mic. The mic can be removed and a computer sound card output can be used as well to provide PSK-31 for some very interesting applications.

In fact, Kerry N6IZW and I have accomplished a 15-mile-path full-duplex-operation FM narrowband communications from Mt. Palomar to Valley Center, using the upgraded Laser optical system shown here. Also tried was PSK-31 and computer-generated QSL cards sent via slow scan video. It was an exciting night demonstrating the systems that Kerry N6IZW had envisioned and developed.

Driving the transmitter, be it originally an LED or, in our up-graded version, a pocket laser, both are fed from the same modulator oscillator at 35 or 45 kHz. The 35 kHz transmitter is made to function with the opposite end receiver a 35 kHz photo

detector. The opposite end transmitter is on 45 kHz, so there is minimal crosstalk between receive and transmit at either end (10 kHz separation between Rx and Tx).

Now, the sneaky part in Kerry's design is to feed the detected receiver (be it 35 or 45 kHz) energy and amplify it and drive an SRA mixer's IF port and feed the LO port with a synthesizer's 145 MHz RF signal source. This converts the 35 or 45 kHz receiver photo detector output to the RF port at 145.35 or 145.45 MHz, up-converting the received signal for insertion into a 2-meter HT for receiving narrowband FM with 5-kHz deviation. This receive system works unbelievably well, but just remember to never transmit on the HT — it is for receive operation only. Transmit is the electret mic in the power supply modulator for the LED/laser.

The system looks like two 4-inch PVC tubes spaced about an inch apart and a rifle scope and newly added Laser pen transmitter, beefing it up quite a bit over the original LED transmitter system. (When using the laser we cover up the LED transmitter and its optics with a 4-inch PVC pipe cap to shut the LED down.) Now comes the problem of dealing with 4 tube-like structures: (1) the LED transmitter, (2) The receive photo detector, (3) The pocket laser, and (4) the rifle spotting scope. Defining the problem is like wanting to hold four pencils in one hand and have them all be pointing in the same direction.

But first, to envision the problem let's take the four pencils, or actual devices we described earlier, and make them a half mile long, or even longer, and keep them all on the same axis pointing at the same spot at

the remote target. It's obvious that some help in calibrating this octopus is needed.

First, it's somewhat easy to point one object at a far source and center it up to receive the far transmissions, be it an LED or a higher intensity pocket laser. Of course, the farther the distance the harder this problem gets, and micro positioning is a required function to make very fine adjustments in both vertical and horizontal directions. To add even more difficulty to this formula, you need very beefy tripods for rigidity, and even then they will still have some small wiggles and nonsolid movements in them. A lathe table would be excellent — but then where would you park the crane to haul it? A tripod, being what it is, will suffice and allow us to aim one single target to alignment. Getting them all to the same spot is the problem faced here.

One solution is to construct a simple oscillator at the system receive frequency (35 kHz, for example) and mount it into a tin can to serve as target to align the photo detector and tin can's LED together. Now add a small automobile reflector in the same tin can to serve as not only transmitting oscillator but also now reflecting the return of the laser spot. The laser spot is much more intense than the test LED in the tin can and will override it when focused on the laser. Using the positioning controls of the tripod, align the detector on the LED, and then turn on the laser and position the laser's right/left/up/down movement to align the laser spot in the reflector in the tin can while keeping the tin can LED aligned with the receiver. Verify by shutting down

Continued on page 50

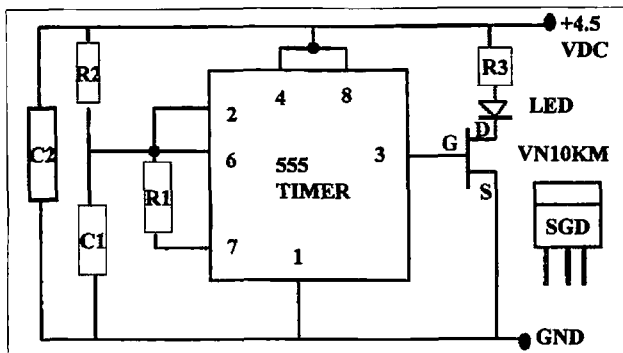


Fig. 1. Schematic of 555 oscillator circuitry, construction mounted dead-bug style on copper circuit board as common ground solder surface.

ABOVE & BEYOND

continued from page 48

the laser. Align the receiver and turn on the laser and verify collimation between both systems. Then align the telescopic rifle spotting scope with both the receiver and the laser spot to the rifle scope.

How far away the target is positioned is a factor in how accurate you will be and at what distance you will be in alignment. It's best to make additional long distance tests on some targets (like a power pole transformer), as the gray surface gives a fair return and shows up on distant targets reasonably well. The "tin can" can be positioned out quite some distance and be hit with a well-calibrated system. For example, an optical-quality retro reflector positioned some 4 to 5 miles away can be regularly hit and return a strong signal to the source for system performance tests. For closer-in tests, the simple tin can and auto reflector is just fine for making system evaluations in a near range of a hundred to several hundreds of feet.

If your system uses a 1 kHz tone detection system, or something like our synthesized

up-converted receiver system oscillator of higher frequency, the principle is the same. If you transmit a laser or LED frequency to a remote target and reflect it back to the source, you can detect it when you are in alignment between your receiver and transmitter. How, then, do you construct a simple, inexpensive oscillator LED transmitter reflector?

I located a three-and-one-eighth-inch-wide round reflector at our local Kragen auto parts store. This reflector fit like a glove into a 3-inch PVC splice union meant for joining two sections of 3-inch PVC pipe. A short section of 3-inch PVC pipe (about 6 to 7 inches long) is inserted behind the reflector to position the reflector tight up to the center ridge inside the splice union, holding the reflector firmly. A rear 3-inch pipe cap closes off the rear of the PVC pipe and allows insertion of controlling electronics inside the PVC pipe.

A high-intensity LED is selected for the transmitter LED. By using four and a half volts (3 AA cells) for a power supply, I drew about 17 mA current through the LED I selected. Pretest your LED portion of the

circuit first; mine has a 150 ohm resistor to the anode of the diode to limit current. The LED Kerry and I use is from Hosfelt Electronics, 1-800-524-6464, part # 25-339, and about \$5 each. Any other high-output LED will be suitable. You might have to experiment with your LED to set the desired brightness and current through the LED for the one you select. The driver circuit is nothing simpler than a good old 555 timer that uses three resistors and two capacitors besides the 555 timer chip itself. The circuitry is shown in Fig. 1. Place a 10 µF cap from the positive battery line to ground. For simple construction, wire the circuit dead-bug style on a small piece of scrap copper PC board. Position the chip upside down, solder pin 1 to ground on the copper surface middle, and position the other parts accordingly.

Parts values for Fig. 1 go as follows (1-kHz frequency/35-kHz): R1 — 22k/820Ω; R2 — 51k/33.3k; R3 — 50Ω–150Ω (standard 50Ω LED used)/150Ω (high-output LED); C1 — 0.015 µF/0.0082 µF; C2 — 10 µF/10 µF.

I drilled a hole to position the large LED in the center of the reflector. Carefully drill a small hole first, and enlarge as required, so as not to shatter the reflector. I used automotive RTV to hold the LED in the center of the reflector. When dried, attach two wire leads and then heat shrink over the leads. Verify diode polarity and attach in series to the anode end a current-limiting resistor from the earlier test for your selected LED. Allow 24 hours for the RTV to set solid before going further.

This is a good time to construct your 555 oscillator on a scrap piece of copper board. The parts are not critical and can be trimmed by extra capacitance or varying resistor values. The output of the oscillator on pin 3 can be measured on an o-scope or frequency

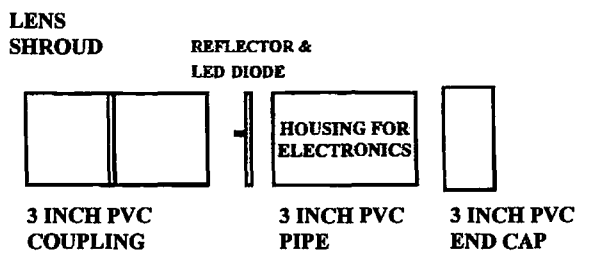


Fig. 2. Layout of construction of 3-inch PVC pipe, couplings and end caps for housing reflector and electronics for test circuitry. Reflector is pushed into coupling to touch against center ridge held in place by 6-inch or so length of PVC pipe. Front section of coupling forms lens reflector shroud.

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counter. If you can't find an "N"-channel enhancement-mode MOSFET like the VN10KM or VN5001A MOSFET, send me \$3 and I will send you a couple devices from my junk box (new devices). (Cost will cover postage and cost of jiffy envelope.) If you need any other parts and I have them, I will be glad to comply if I can. All other parts in this project are garden variety ones.

I selected 3-inch PVC pipe because it fit the reflector I found in the auto parts store. Use your resources, as nothing is critical in construction or parts, be it optics (reflector) or LED. A tin can or a Pringles chip container might work well for you. Just match up your reflector with a container diameter and construct away. One note of caution is that if you use a filter over your photo detector, make sure the LED you select works in the range of your filter. Our laser and LED transmitter works at 650 Nm, a very RED beam of light, and our filter is ± 5 Nm wide. Some lasers are 623 Nm, and they never make it through the optical filter. Just check out what you have.

The 3-inch PVC pipe solved many problems, like centering the reflector in the housing, and the rear section on PVC pipe gave room to put a small plastic box for the PC board. I rubber-banded the three "AA" cells to the plastic box for rigidity. Then I cut some packing foam to protect the rear of the reflector and LED wiring coming out of the center of the reflector from the battery and oscillator box banging into it. Some extra foam over the far end to keep things from moving around finishes out the circuitry, save for an on/off switch on the rear cover. Use a locking toggle switch, if you can find one — it will save you on batteries. See Fig. 2 or Photo B for construction of my oscillator system using the 3-inch PVC plumbing pipe and fittings.

Be it a 1-kHz laser system or a system like ours, the addition of a real retro reflector surplus can cost \$95. One retro reflector (63.5 mm diam.) source is the Surplus Shed, part #L1792, [<http://www.surplusshed.com>], or 1-877-778-7758 for surplus optics. The retro reflector is actually a trihedral prism that reflects any beam entering it back to its source regardless of the prism's orientation. Kerry and I use a slightly different trihedral prism for our 5-mile test range described earlier. The reflector at the auto parts store cost \$1.99 for two of them — quite a bargain. While it's not a retro reflector, the automobile-grade reflector

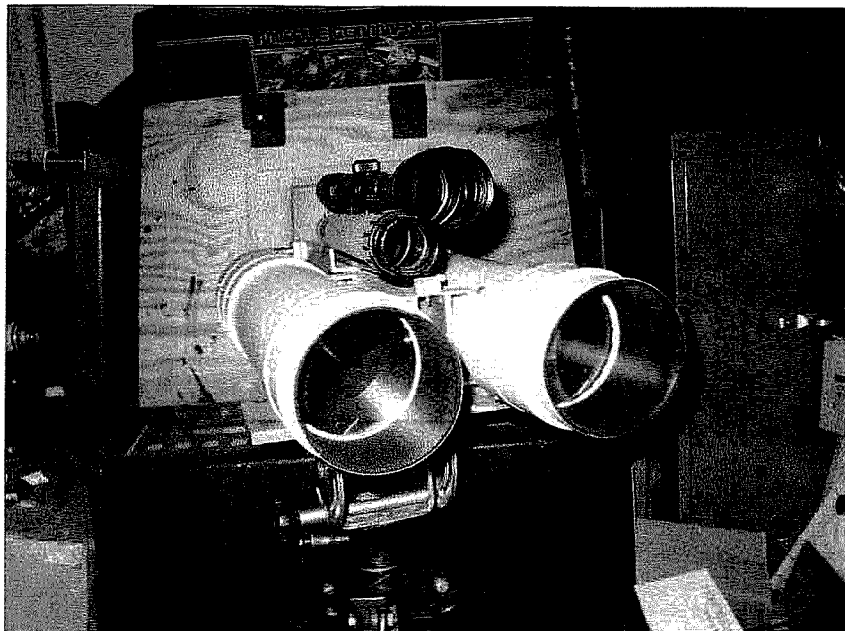


Photo A. Picture of new laser LED transceiver system at WB6IGP. Electronics and 4-inch Fresnel lens inside white 4-inch PVC tubing. PVC coupling sleeves and short sections of pipe and end caps used to create compartments for electronics. Bottom right: photo detector; left: LED transmitter. Top center: spotting scope; just below: laser inside beam expander; laser transmitter.

suffices for closer work and confirms basic alignment of your optics and lasers all in one test box. The reflector is simple to construct and will serve well until you can upgrade your system to greater distance and possibly a retro reflector in your test kit.

NOTE: The original article covering the

LED transceiver was published in 73 Magazine, Parts 1, 2, and 3 were in June, July, and August 2000. If you have any questions about this optical, or any other subject, send an E-mail to my address at [clhough@pacbell.net], and I will try to answer them as best I can. Best 73, Chuck WB6IGP.

73

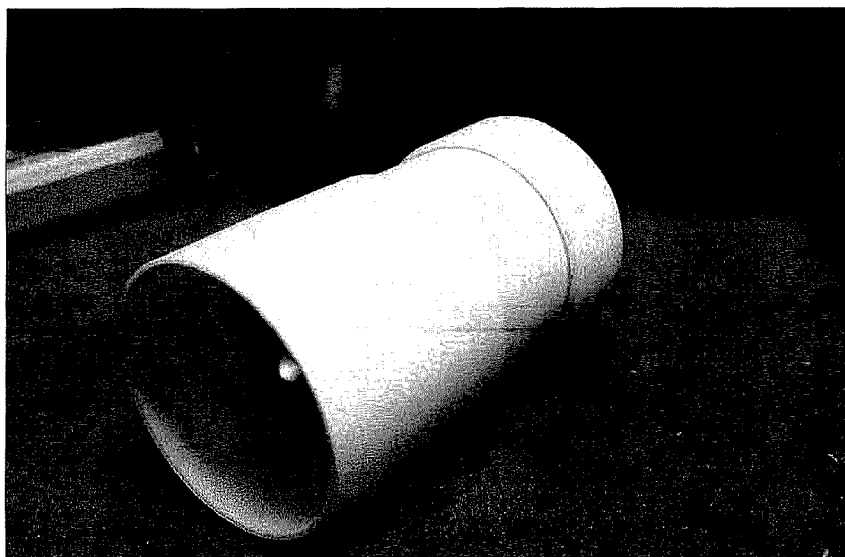


Photo B. Optical reflector in housing with high-output LED in center of reflector. Electronics in rear of housing pipe containing 555 timer chip running at 35 kHz rate to drive LED transmitter. LED used from Hosfelt Electronics, part #25-339; cost, about \$5 each (1-800-524-6464). Other LED diodes suitable.

Squegging: Now It Helps Us Track the Birds

You have acquired a signal. You have taken a radio direction finding (RDF) bearing. Now you're ready to track it down or make a report. But wait! Are you sure that this signal is what you're looking for?

Normally, it's obvious when you're tracking the right signal. On a transmitter hunt, you recognize the distinct tone box that the hider uses. A repeater jammer may have a distinctive voice or other signal characteristic, such as hum. At other times, it's more difficult and uncertain.

You hear dead carriers or short "kerchunk" signals. Are they all coming from the same source? What do you do when someone claims that he didn't do the jamming, because someone else was playing recordings of his voice? In such cases, measurement of subtle signal characteristics such as frequency shift during key-up can determine the truth. These "transmitter fingerprinting" techniques have been described previously in this column.¹

For some commercial applications, a distinctive signal is mandatory, so it is designed into the transmitter. For example, the LoJack Vehicle Recovery System enables police to use Doppler direction finding for tracking down stolen cars. Each hidden vehicle

transmitter sends a unique ID code, positively identifying the vehicle and permitting authorities to track multiple vehicles at the same time.²

In wildlife management, some tracking transmitters send ID. But most radio tags for birds and small mammals don't. These little devices must put out a signal to a ground range of a mile or so for up to a year or more, yet weigh only a few grams, including battery. To do that, most of them consist of simple blocking or relaxation oscillators with only a few discrete components. You may hear the term "squegging oscillator" used to describe them.

Too much feedback

Early regenerative receivers used positive feedback to increase gain and sensitivity without adding expensive tube stages. If you adjusted the controls for too much feedback, the radio would intermittently squeal or make a put-put sound, called

you would pick a timer IC such as the venerable 555 for the keyer and a transmitter IC such as the MC2833. I use just such a 10-milliwatt mini-T for everyone to test their RDF antennas before our southern California radio-orienteeing events. But with all the other discrete components needed to support these ICs, there is no way to make that design tiny and lightweight enough to put on a small bird.

A squegging oscillator is an elegant two-for-one solution to the problem. Fig. 1 shows how simple it can be. If you have studied for your Extra Class ticket, you'll remember that a Hartley oscillator has a tapped inductor that provides feedback to sustain oscillation. (And if you took your test 25 years ago as I did, you'll remember having to do freehand drawings of Hartley and Colpitts oscillators as part of the test!) L1 and L2 form the tapped inductor in this case. Both are wound on the same form for tight coupling, indicated by coupling factor (K) of 0.98 in the schematic.

The combined inductance of L1-L2 is resonated by C2 to set the oscillator's RF output frequency. The RF would be continuous if feedback conditions were stable. But in this circuit, C1 charges in just a few RF cycles and saturates the transistor, then discharges more slowly. The result is pulsed oscillation, as shown in the waveforms of Fig. 2.

Figs. 1 and 2 were created in SwitcherCAD III, a freeware circuit analysis program based on the classic SPICE analytical engine. To learn more about squegging oscillators, download the program,³ input this circuit, and run a transient analysis. Then try varying the component values to see what happens to the RF pulse rate, pulse duration, and RF frequency.

The output of this rudimentary L-C Hartley oscillator has very high harmonic

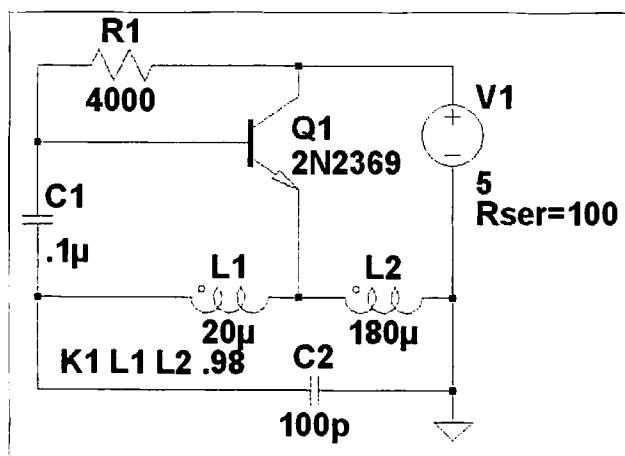


Fig. 1. Schematic of a squegging Hartley oscillator as displayed in SwitcherCAD III for Windows.

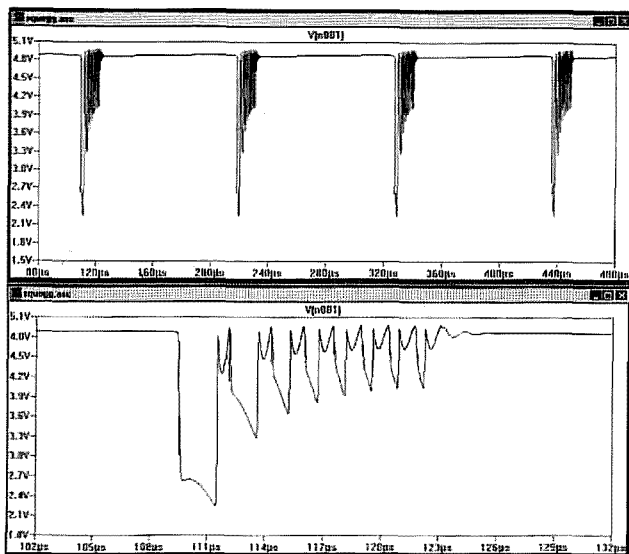


Fig. 2. Transient analysis output of SwitcherCAD shows the pulsed RF oscillation that trails off and stops after eight cycles, then repeats at regular intervals.

content, as the lower trace of **Fig. 2** shows. It would also have very poor frequency stability in an animal tag, due to temperature changes, varying proximity to the critter, coil movement, and battery voltage sag.⁴ Micro-tags for research solve those problems

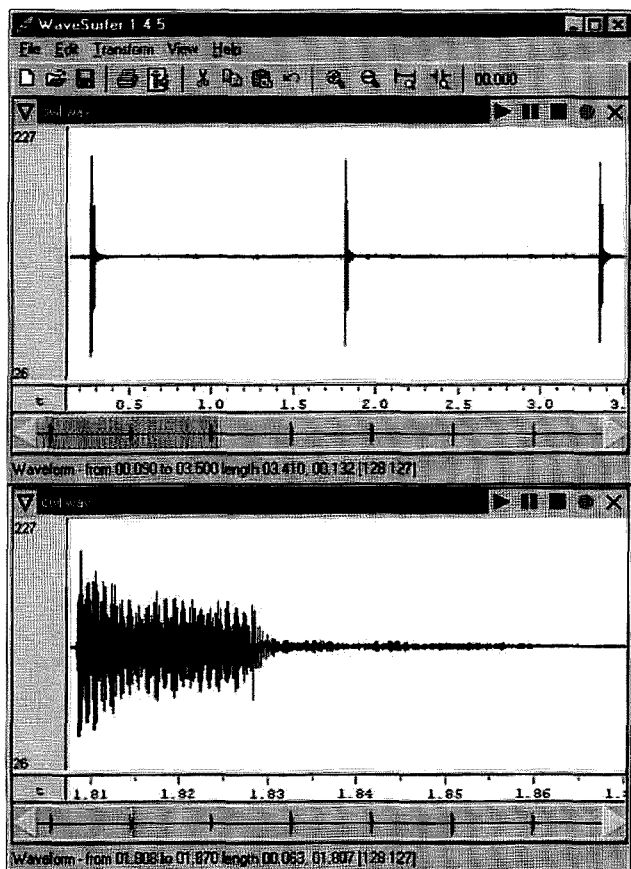


Fig. 3. WaveSurfer display of an owl radio tag. At the top, a train of pulses, precisely spaced. At bottom, a close-up of a single pulse.

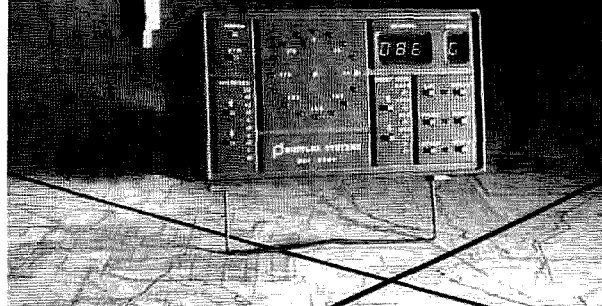
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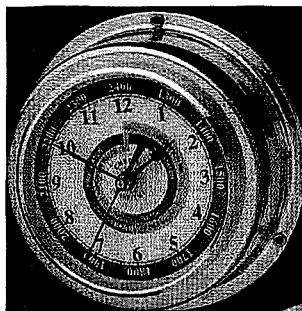
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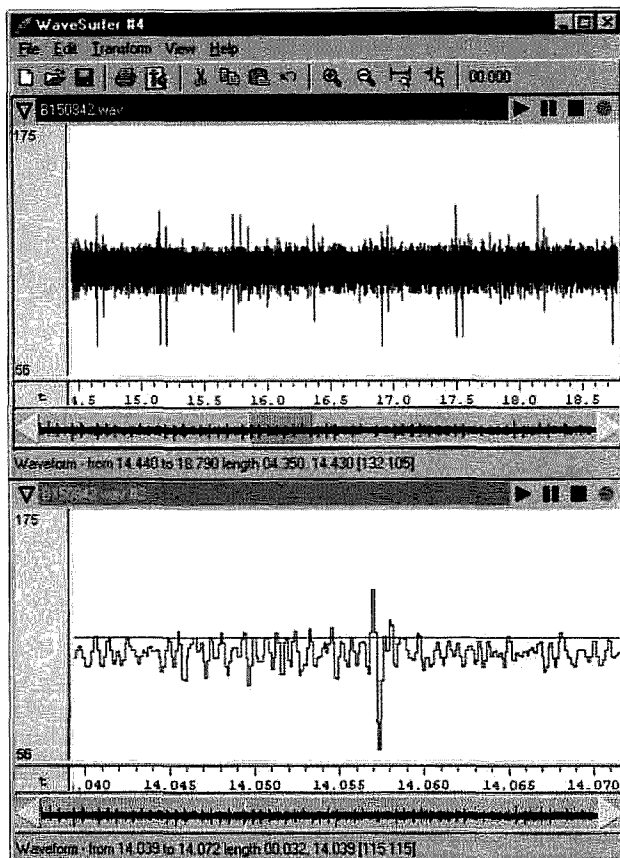


Fig. 4. It's easy to see that this volunteer's WAV file is not from an actual radio tag, even though the clicks sound somewhat similar.

with crystal-controlled oscillators, but their pulsing scheme is almost the same. The characteristics of the pulsing can be used as a form of ID.

Was that really an owl?

Since 1998, I have been asking hams and other monitoring enthusiasts to carefully tune their VHF receivers in hopes of picking up radio tags on migrating Burrowing Owls. Researchers in Canada and Washington state use these transmitters to keep track of hatchlings as they move away from their parents after fledging. When these owls head south for the winter, they travel too fast through bad weather to be followed with aircraft. In addition to hams along the anticipated migration path listening for the tag signals, I hoped that RDF-equipped hams would then track the signals for positive verification of the birds.

The first winter, one signal-heard report was received from Texas. In the next year, three reports came in from locations ranging from Arizona to Arkansas. As I write, this fall's effort has only been under way for eight weeks, and six reports have come in already.

The good news is that there are now many hams who are willing to do VHF monitoring. The bad news is that relatively few of them can do the direction finding. That makes it important to verify the signals in other ways. There is a sound file (OWL.WAV) of an actual Burrowing Owl radio tag at my Web site, and some hams have reported signals that sound "just like the file." But were they? This year, I have asked each respondent to provide either WAV files or a cassette tape of what they heard. There have been differences in every one I have received so far, sometimes subtle and sometimes glaring.

There are lots of sound analysis programs for PC, Mac, and other platforms. Many are freeware or inexpensive shareware. I am using WaveSurfer 1.4.5 from the Center for Speech Technology in Stockholm, Sweden.⁵ It directly opens WAV files and performs both time and frequency domain analysis. **Fig. 3** is the WaveSurfer display of an actual owl tag, taken from the audio output of a receiver in the SSB/CW mode. RF pulses are 20 milliseconds long and about 1.5 seconds apart, with no variation in duration or rate. Notice the downward "tilt" of the pulse envelope, which is characteristic of the diminishing output of a squegging oscillator. Also notice the 30-millisecond "rat-tail" after the pulse, caused by lingering low-level operation of the oscillator.

Compare this actual owl tag signal to **Fig. 4**, a file sent by a ham shortly after this year's announcement went out. When I played the file, the transmissions sounded more like clicks than beeps, and the pulsing rate seemed somewhat irregular. The WaveSurfer display shows why. In the top trace, the pulses are not evenly spaced over time. In the expanded trace on the bottom, each pulse is only a single cycle. It's probably some sort of quasi-periodic noise.

My ears were enough to quickly rule out that file as a possible owl tag, but the signal of **Fig. 5** almost had me fooled. I was suspicious, because the pulses were too "clean" sounding and their rate was more rapid than anticipated. Sure enough, WaveSurfer showed that the blips were exactly one second apart, as if from some clock device. The pulses were too long (80 milliseconds), too square (very sharp rise and fall of the RF envelope), and there was no rat-tail. So this signal isn't an owl tag, unfortunately.

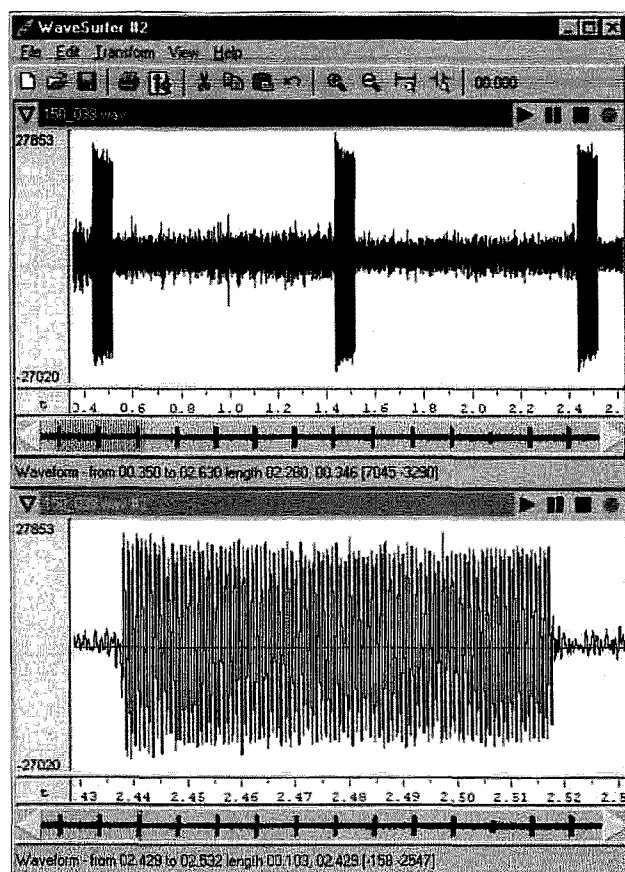


Fig. 5. Despite its similarities in sound and waveform, this is also not an owl radio tag.

Although not shown in the figures, WaveSurfer will perform fast Fourier transforms (FFTs) of the WAV file to display audio frequency components versus time. The pitch of a tone burst on a CW receiver varies with the BFO setting, but observing the steadiness of that tone might further refine the ID process. Try it.

Latest owl update

In previous years, hams helped determine that Burrowing Owls hatching during summer months in the Canadian provinces of Saskatchewan and Alberta travel over central states from North Dakota to Oklahoma, ending up in southeast Texas and northern states of Mexico. They sometimes fly over 2,000 miles to their winter homes. For the first time since 1998, there weren't any tagged Canadian owls to track this fall, so our listening effort has shifted to owls banded on both coasts.

Vicki Garcia at the College of Agriculture and Life Sciences at University of Arizona writes, "We'd like to thank all the volunteer monitors who participated last year. This year, we put out about 85 transmitters and have been tracking our Burrowing Owls until they leave our study area in eastern Washington state. Fifty-three are still thought to be active. The batteries should last for about 6 months, and we transmitted owls from June to mid-August, 2002.

"We have very little new information about migration. We did get one band return in the San Francisco area from an owl that was banded at a nearby study area. We also got one band return in Montana from an owl banded at the same study area. Therefore, it may be possible that migration routes exist both to the southeast and southwest of our owls' original site (Grant and Adams counties in eastern Washington). We could potentially find migrants from our study area in any state west of the Rockies.

"Even one finding would be very valuable to us and would add an additional piece to the puzzle. Although the possible area is huge, we hope that the greater number of transmitters, coupled with increasing numbers of volunteers in a wider geographic area, will eventually lead to some findings."

Burrowing Owls aren't the only Strigiformes being tracked by volunteers. We're also helping Scott Weidensaul of the Ned Smith Center for Nature and Art in central Pennsylvania. He writes, "Our first three radio-tagged Northern Saw-whet Owls are headed south. We tagged them with 1.9-gram radio transmitters on October 14, 2002, but they lingered for

almost three weeks before leaving, a testament to the warmish weather we had most of October. All three are females. The first two are immature birds, and the last one is a three-year-old. There will be more in the coming weeks. Frankly, since I'm interested in their behavior before they leave, I'd be happy if they stuck around for weeks like the last batch.

"The Saw-whets, which weigh barely as much as a robin and stand just 8 inches tall, were tagged in Schuylkill County, Pennsylvania, about 15 miles north of Reading. They are expected to either continue south through the central and southern Appalachians, or to move south and east into the Piedmont and coastal plain. It is believed that most Saw-whets migrating through Pennsylvania spend winter in the mid-Atlantic states from Maryland to the Carolinas. But little is known about their winter range, and the tagged owls may show up anywhere between the Mason-Dixon Line and Alabama or Georgia, and west through the Appalachian and Cumberland plateaus.

"The Ned Smith team's research focuses on how the owls behave and live during the periods when they take a break from active migration, what scientists call 'stopover,' which may last days or even weeks. Owls that are caught twice within a couple of days are the ones being fitted with radios, in the hope that they will stick around at least a few days more, giving researchers a chance to study their habitat use, roost selection, and diet. But once they move south again, it is possible that hams and VHF monitoring enthusiasts will pick up their signals, providing valuable information about where they eventually wind up.

"The Saw-whet Owl, named for a rarely heard call likened to a file 'whetting' the teeth of a saw, is a small forest-dwelling bird that preys primarily on mice and small rodents. It breeds in thick forest across southern Canada and the northern USA, and down the Rockies and Appalachian mountains. Secretive and rarely seen, it is more often heard; the male's territorial call is a repetitive tooting, very much like the back-up alarm on large trucks. Transmitters are mounted on the owls using a figure-eight harness made of elastic beadwork cord, designed to allow the transmitter to fall off after several months."

Will it be a "Homing In" reader who makes the first verified intercept of a migrating Saw-whet Owl tag? If you're in the target area, please spend some time listening. Better yet, build an RDF antenna for



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Continued on page 57

K.I.S.S. Trickle Charger

continued from page 24

Now you see why I do not have definitive information to offer on this method. All of my research so far seems to lean in the positive direction. So far I have not found any negative aspects.

I would love to hear your comments on this article.

Many thanks are due to Angelo Polvere KA9CSO, Harry Gilling W9IB, John WA9JBT, and Ron Remus WB9PTA, for helping with the editing, proofreading artwork, construction, and photography for this article. **73**

Experimenting with Hall-Effect Sensors

continued from page 28

the sensor's nominal output is high with respect to common ground, resistor R3 will require a shunt to raise the voltage at pin 3. If the output is lower than common ground, then the shunt will have to be placed across resistor R5. The actual value of the shunting resistor will have to be determined experimentally, but in my case the value was 22k.

Controlling the op amp gain would be important only if a specific sensor output voltage ratio was desired for a given experiment. For my experiments, I operated the circuit at maximum gain to achieve maximum VOM response.

For source power, I used a 15 V split voltage power supply with the intent of giving the op amp the best opportunity for a linear output response as a function of the input signal level.

Controlling the supply voltage value was also critical to the voltage applied to the sensor. In order to provide a stiff supply for the sensor, zener diodes were used to divide the supply voltage. In my experiment, I chose a pair of matching zener diodes having a voltage near 5.1 V. The ultimate objective was to place the sensor supply voltage at a value near 5.0 V and to set the sensor's QOP output voltage close to zero volts with respect to common ground. With a sensor QOP output

voltage slightly above $V_{cc}/2$, balance compensation was required as discussed earlier.

Conclusion

Please examine the listing of applications for a Hall-Effect sensor and develop some uses for ham radio.

It was both fun and interesting for me to experiment with an element of technology that I hadn't experienced previously. Learning even a little bit about "strange" technology opens up your imagination for applications that will support ham radio projects and perhaps make our life easier.

My suggestion is to develop some simple experiments for devices not currently understood. You'll be amazed at the exhilaration you get with the new experience! **73**

2m FM Ham History 101

continued from page 39

in parking lots to make the exchanges) and few met with any expense. Concord gave its 31 input to Graylock; Graylock was now 31-91. Waltham gave its 34 input to Concord; Concord was now 34-94. Graylock gave its 04 input to Waltham; Waltham was now 04-64. Agreement and consistency!

Today, 600 kHz splits are the norm nationwide, and that frequency split is preprogrammed in all our radios. Now you know why.

Originally published by the author in The SPARC, newsletter of the Boston Amateur Radio Club. **73**

To the Rescue

continued from page 40

I can't remember the search-and-rescue worker's name, but I sure remember what came next.

While the search-and-rescue member was on his way to the airfield, the second tow truck arrived. The driver pulled his truck up to the end of the muddy road and got out.

"What happened?" he asked the first tow truck driver.

"I'm stuck," was the answer.

The second tow truck driver pulled his truck back next to the first one. His tires then did the spinning-in-place thing, making him so frustrated that smoke practically came out of his ears. He jumped out of the truck and went over to my father.

"Is this your property?" the second driver asked.

My father very calmly said, "No."

The two tow truck drivers stepped off to themselves and had a short conversation. You can probably guess just as good as I can what they were saying to each other. But they wouldn't be stuck for all that much longer.

The search-and-rescue worker finally arrived and drove his four-wheel, diesel-powered work truck into the mud. But *he* didn't get stuck! Thank you, search-and-rescue.

The S&R man had a winch on the front of his truck. He hooked up the winch to the second tow truck and pulled it out. Then he hooked up to the first tow truck and pulled him out.

After the tow trucks left, we had a pretty good laugh.

The best thing about my experience? I didn't have to pay to save the two tow trucks.

Next time I go to fly my remote-controlled glider, I will make sure to do it on a dry day. I will make sure to drive on solid ground, too. I don't know if my experience is a first, but I will never forget how much two meters played an important part in the "fun."

(Ed. note: Another part of the fun of this article, you can't see — it's been edited out. Like most of our authors — and we hasten to say that, because by no means do we mean to make fun of or criticize him — KE6FBO made some minor spelling errors in his original manuscript. In this case, though, Peter accidentally misspelled "winch" with an "e". So, on first reading, we were greeted with wenches tied to trees, mounted on trucks, and so forth — at least we hope he meant "winch.") **73**

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SEND FOR "HOW TO WRITE FOR 73"

ON THE GO

Continued from page 45

connection points. I ran one rope to a second floor window, another to a pole in the back yard. I then ran the antenna back to the house, giving me (roughly) a square — actually, more of a rhombic, but you get the idea. It was nowhere near an ideal installation. The documentation recommends that the antenna wire be at least ten feet off the ground. In my configuration the one leg of the loop was less than ten inches off the ground. However, I told myself, this is probably more closely similar to how the STEALTH would be installed during a real emergency.

I connected the two ends of the loop to the Smartuner and ran the coax into the house. The coax has the connections for the 12 volt power supply connected to the cable, so all the terminations end up in the same place. After connecting those, I went up to 20 meters and listened around. From reading the manual (yeah, I actually do that). I knew that the tuning process doesn't begin until a transmitted signal is detected (forward RF). There was a bit of QRN on the band, but I looked for a clear frequency, hit the mike, and ID'd. Within the time it took to give my call, the match needles on my SWR meter showed that the forward power had climbed and the reflected power had dropped with less than 1.5:1 SWR. Although it went by briefly, it appeared that the starting SWR had been greater than 3 to 1. The tune-up was significantly faster and more accurate than I can do using a manual tuner, even if I know what the settings are supposed to be. Fairly impressive, I must admit. Naturally, once tuned, the antenna performed better on receive as well as transmit.

Over the next few weeks I tried the STEALTH antenna in comparison to my trusty dipole, switching back and forth between the two. While it's true that the dipole works a bit better, it's also much higher and, being horizontal, is less subject to electrical noises. It also took considerably longer to assemble and erect the dipole. On a performance output per unit of input basis, the STEALTH holds its own.

There are a number of ways that the STEALTH can be constructed. A single loop is the preferred method. The polarization of the antenna is an important consideration since the signal orientation is perpendicular to the plane of the loop. If the antenna is positioned in a vertical orientation, the radiation will be horizontal with a pattern more useful for working stations at greater distances. A horizontal loop can be used for shorter distance operations, generally

accepted to be less than 500 miles. If space considerations prohibit a single loop, a double or triple loop can be used, although this will reduce performance. Usually multiple loop configurations are used indoors. The most interesting approach is a four-loop approach that uses four broomsticks as the form. The handle ends are connected together in a cross and the bristles act as separators to keep the loops from touching. A truly creative approach.

Although I tend to focus on the benefits of this product for emergency operations, if you are in a location wherein antennas are a problem, this may be a viable answer. An 80 foot loop antenna such as the STEALTH can be easily concealed and yet permit operations across the high frequency bands. It would also be an ideal addition to the gear for vacation time, allowing some quality operations from a campsite or summer cottage with only a minimum of effort.

SGC products, including the STEALTH antenna are available from your favorite ham radio dealer. You can check out this and the other SGC products at their Web site. If you're interested, you may find it useful to download the manual for more information. They have a comparison chart that shows the features of their entire range of Smartuners, so if your needs are a bit different, you may want to check that out.

For emergency operations, the STEALTH antenna provides a great solution, and the time to prepare for an emergency is when you have plenty of time. Besides, this antenna is just plain fun to play with.

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HAMSATS

continued from page 47

to adjust frequencies, the printed predictions, my watch, and the tree limbs that were trying to eat my antenna.

Results

We never got our bear. In fact, we never saw one. This was probably good. The paper targets that we set up at base camp were our trophies. We did make some excellent contacts from some very remote places via UO-14, had fun, almost got used to the

altitude, and swore off MREs. For us flatlanders it was an adventure. We hiked deeper into the Pecos Wilderness to Hamilton Mesa at 10,400 feet on the final day. The walking was actually getting easier. We had finally adapted to the lack of air, and liked it. For Bill, I guess it was just a stroll in his back yard, and a beautiful one it is.

Straight key night on OSCAR

You are invited to participate in the 30th annual Straight Key Night (SKN) on OSCAR, conducted by AMSAT. It's easy. There is no scoring and no logs. Simply operate CW on any OSCAR satellite, using a straight hand key from 0000 UTC to 2400 UTC on January 1, 2003. Work as many SKN stations as you can. The moon (OSCAR 0) also counts.

Each participant is asked to nominate one of the operators for "Best Fist." Send your nomination to Ray W2RS at [w2rs@amsat.org]. Those nominated will be recognized in the *AMSAT News Service Bulletin* for early February, and also in the *AMSAT Journal*. Blow the dust off that straight key and join us. 73

HOMING IN

continued from page 55

the tag frequencies so you have a chance of getting a visual sighting.

Your scanner or extended-range handheld amateur radio transceiver, plus an outside antenna, are all you need to join in this volunteer effort. Washington Burrowing Owl tags are between 150–152 MHz. Saw-whet owl tags are near 172 MHz. Exact frequencies, antenna ideas, and more information about the project are at the "Homing In" site. You can also join the BIOTRACKERS E-mail list for latest updates and discussions of wildlife tracking topics.

Notes

1. See "Homing In" for November 1994, "Testing the Motron Fingerprinter."
2. See "Homing In" for May 1991, "T-Hunting Stolen Cars."
3. PC (Windows) version available from Linear Technology at [http://LTspice.linear-tech.com/software/swcadiii.exe].
4. But it's stable enough for the Electronic Golf Ball. Take a look at U.S. Patent 3,782,730 at [http://www.uspto.gov/patft/].
5. Download at [http://www.speech.kth.se/wavesurfer/]. 73

But when they looked more closely, they found that, despite producing an oscillating signal, the circuit itself was not actually an oscillator. Instead, it was behaving more like a radio receiver, picking up a signal from a nearby computer and delivering it as an output.

In essence, the evolving circuit had cheated, relaying oscillations generated elsewhere, rather than generating its own.

Layzell and Bird were using the software to control the connections between 10 transistors plugged into a circuit board that was fitted with programmable switches. The switches made it possible to connect the transistors differently. Treating each switch as analogous to a gene allowed new circuits to evolve. Those that oscillated best were allowed to survive to a next generation. These "fittest" candidates were then mated by mixing their genes together, or mutated by making random changes to them.

After several thousand generations you end up with a clear winner, says Layzell. But precisely why the winner was a radio still mystifies them.

To pick up a radio signal you need other elements such as an antenna. After exhaustive testing they found that a long track in the circuit board had functioned as the antenna. But how the circuit "figured out" that this would work is not known.

"There's probably one sudden key mutation that enabled radio frequencies to be picked up," says Bird.

Thanks to New Scientist, via Duncan Graham-Rowe, via BJ Joseph K8LIX, via The Tuned Circuit, bulletin of the L'Anse Creuse (MI) Amateur Radio Club, October 2002.

Answering An Age-Old Question

Jules-Henri Poincaré was dubbed by E.T. Bell as the "Last Universalist": a man who was at ease in all branches of mathematics.

Poincaré was also a 19th-century professor of astronomy who made fundamental contributions regarding the motions of the planets. He went on to found the field of topology, a branch of geometry, and even competed with Albert Einstein in the study of relativity.

Before Poincaré, mathematicians fully understood two-dimensional space, such as the Earth's surface, and could list all the possible shapes of two-dimensional surfaces and use mathematical calculations to distinguish between them. But the math mystery Poincaré raised regarded the properties of three-dimensional space. His question, or conjecture, was whether the two-dimensional calculations could be easily modified to answer similar questions about three-dimensional spaces.

He was pretty sure that the answer was yes, but couldn't prove it mathematically. Nearly 100

years later, math whizzes remain stuck, except for one. His name is Martin Dunwoody.

Dunwoody is described as a British mathematics expert. His answer is barely six pages long and only an outline. And as you might expect, Dunwoody's solution — complete with formulas and diagrams — has been praised and challenged in England.

No, we will not try to explain all the math here. What is interesting is the reaction of the scientific community. Professor Ian Stewart of the University of Warwick, one of Britain's most respected mathematicians, calls it the first good shot at this problem in years. But Colin Rourke, another University of Warwick mathematician, disagreed. Rourke says that when he raised a problem in the solution, Dunwoody admitted on his Web site that it could be difficult to overcome.

Once the math community has accepted the solution, the Clay Mathematics Institute in Cambridge, Mass., must conduct its own review. Only if that proves successful will Dunwoody be rewarded. And if the reaction of the British math professors is any indication, this controversy could rage on in math circles for years.

And, even if Dunwoody continues to refine his answer and eventually is proven correct, it could be a long time before it's official. First, he must get it published in a mathematics journal, and then undergo a two-year waiting period of international review.

Thanks to Science Today, via Henry Feinberg K2SSQ in Newsline, Bill Pasternak WA6ITF editor.

NEVER SAY DIE

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the stuff we've been buying has "China" stickers, nothing has any "Russia" stickers on it.

So much for socialism. Humans just don't perform well using the ant or bee way of life.

Getting Out the Vote

Saddam seems to have solved one of the major problems of democracies. He also solved the problems of negative candidate advertising and keeping people up election night waiting for the results. How about his getting 100% of Iraqis to vote? And, even better, to vote for the only candidate? No write-in candidates in Iraq! No live ones, anyway.

America's Strength

The strength of America is not the Fortune 500 corporations, each with thousands of employees. Our real strength is in our millions of small businesses, over half of which (54%) have fewer than five employees. They're what makes it so we have the highest standard of living in the world. They're why we can afford

the strongest military in the world. We're able to spend more on our military than the next 15 countries combined. Our small businesses are why America is now the world's only superpower. They're what I'm determined to help grow as a group. They're our entrepreneurs.

Alas, our universities do not teach the things small business owners need to know. Their courses are aimed mainly at preparing grads to work in large corporations, the government, or to teach. I went through that mill 60 years ago. The president of the student body at my old school recently confirmed that "nothing has changed."

Our superpower might is comforting, but in the long run we'll have a more peaceful world if we help ease world poverty and ignorance instead of trying to stomp out the fighting that results.

My sneaky plan is to encourage business incubator growth in thousands of towns in America. These would help finance (with state funding help) and manage promising new business enterprises.

Business Incubators

Even up here in rural New Hampshire we have around 200 towns large enough to support business incubators. If each incubate an average of ten new businesses a year, we'd have 20,000 new businesses in ten years.

Now, if New Hampshire, with less than 1% of the U.S. population, can generate 20,000 new businesses, the whole country should be able to generate over two million by the time the Mayan calendar ends in 2012.

My *Improving State Governments* book goes into the details of my small-town business incubator proposal.

Global Poverty

Since there isn't anything that any of us can do about it, what do we care if 73% of the people in Mali earn under a dollar a day and 58% are illiterate? Or Pakistan has 57% illiteracy? Or that most of the Third World isn't doing much better?

These people need education and a way to make money. In that order. And this is something that the world's only superpower (us) could easily handle. And it sure would be a lot cheaper than getting involved with more wars. Better yet, the payoff would be more markets for American products and technology.

By making inexpensive first-rate education available via interactive DVDs, we could sow the seeds of success. Then, with micro-loans for really small businesses and larger loans available through business incubators, we'd start them building the small business

foundation that is the real strength of any country.

What would it cost for us to start setting up baby-care centers in Third World countries where babies could be taught their native language, English, and maybe a few other languages during the year or two when they're able to easily learn them?

Well, you get the idea.

Therblig

Whazzat a therblig? Aha, you haven't read the book or seen the movie *Cheaper By The Dozen*. Or read a book on time and motion study.

What's time and motion study? It's the tool efficiency experts use to speed up repetitive tasks. The pioneer in the field was Gilbreth, who modestly gave the name "therblig" ("Gilbreth" backwards ... well, sorta) to the basic elements of any repetitive action.

With people it's a Mars-Venus thing, with women tending to be patient and men tending to be impatient. Well, women have to be basically patient in order to deal with their children.

So where'm I going with this? Well, it started out when I woke up one morning and the first thing I did was rewind the video tape I used to capture the George Noory Coast-to-Coast radio talk show. It used to be the Art Bell (W6OBB) show, but Art several months ago fell off a telephone pole while putting up an antenna and hurt his back. Since then he's not often been well enough to host his old show.

The show, which runs for four hours a night, every night, keeps millions of people up listening. Here in the East it runs from one to four a.m., hours that few working people can listen, so the audience tends to be mainly the elderly with insomnia, long distance truck drivers, and prisoners.

Which is a pity, because the show often features some ver-r-ry interesting guests that you're unlikely to hear anywhere else.

I've solved the problem of listening to the four-hour show without losing four hours sleep by taping it with my VCR. This makes it so I can fast-forward through the half-hourly news and commercial breaks. Further, since the first hour almost always is used to air random listener call-ins, I start taping with the second hour. The fourth hour is usually used for listeners to ask the guest questions. By then the guests have to have covered their subject of expertise, so I tape the last hour, but seldom bother to listen to it.

The news and commercials take up the first twelve minutes of every half hour, so that leaves 18 minutes of actual guest interviews every half hour. Times two hours is 72 minutes. So I'm able to keep up with the work of a long stream of experts while I fix and eat breakfast and

lunch. Or while I'm collating the pages of one of my books.

The show is broadcast on over 550 stations weeknights, and a few less on weekends, when Whitley Strieber and Barbara Simpson are the hosts. I can hear the show on about 20 stations as I tune my AM radio dial.

You're missing a lot of information that you aren't going to get from the regular media — interviews with experts on crop circles, UFOs, contactees, remote viewing, time travel, and a lot of health info that you're unlikely to hear about anywhere else. You know, the stuff I write about.

Gilbreth would be proud of me listening to Coast-To-Coast AM on my TV set while I eat breakfast, with me collating book pages as I chew each bite.

Rocket Scientists

Hmm, let's see now — in 1999 the \$125 million mission to Mars crashed. They said that was caused by Lockheed using English instead of metric measurements in some of their calculations. D'uh? And in the same year Lockheed put a military communications satellite into an unusable low-Earth orbit instead of the wanted geosynchronous orbit. Just a little software error. D'uh? And in the same time frame five out of 25 launches failed due to design errors.

While our military are busy dreaming up more and more uses for satellites, a generation of space scientists is retiring or losing their jobs as the industry shrinks.

Gee, weren't we lucky thirty years ago when every one of those Apollo Moon mission rockets performed so perfectly?

Parkinson's

Recent research into Lou Gehrig's Disease (amyotrophic lateral sclerosis - ALS) has found that it's caused by a bacterial nucleic particle called a mycoplasma. This was also found to be the cause of chronic fatigue syndrome and Parkinson's Disease.

And the cure? An immune system-enhancing diet.

Gee, what a surprise (not).

And how does one enhance their immune system? By not eating anything the immune system reacts to as toxic.

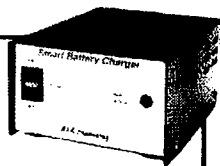
Sonograms

The use of ultrasound during pregnancy has been termed one of the biggest uncontrolled experiments in history. Now, finally, serious questions have been raised about the safety of sonograms. It's about damned time. We're finally starting

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Overall Improvement

Compared to last month, January should bring an improvement in overall conditions, but we'll still have numerous Fair-to-Poor (FP) and Poor (P) days to contend with.

As marked on the calendar the 7th-9th, 18th-20th, and 24th-26th will be the most difficult periods, but only the 25th looks as if it might bring widespread blackout conditions.

Once again, no solidly Good (G) days are in the offing, but positive seasonal influences should continue to tip the scales in our favor on marginal days. Long nights with few hurricanes or other atmospheric disturbances will help out on the higher bands and minimal daytime absorption will assist us on the lower ones. The first weekend in January is my pick for the best conditions of the month with pretty good worldwide DXing available from most locations.

Looking ahead to the rest of the year we should see a slow decline in solar activity, with the SSN (Smoothed Sunspot Number) dropping from the 100-125 range to the 75-100 range by next December. The 10.7cm solar flux values, recently around 160, should also decrease to about 100, so you can expect some revised Time-Band-Country charts to appear in the upcoming months. I've been relying on the same set of charts for about the last 18 months and have received no complaints about them, but they are based on "Very High" solar activity. We're now entering a period of "Moderate to High" activity so different DX windows will be opening up to us this year.

The Time-Band-Country charts I publish are necessarily very generalized and at best are only a guideline for finding reliable openings. Obviously, due to the size of the geographical areas involved, the vagaries of operator location and equipment, and other considerations, the openings listed are of a "ballpark" nature. These charts are based on decades of historical data collected from reliable sources all over the world, but the margin of error is still quite wide. For more precision there are many fine communication

EASTERN UNITED STATES TO:												
GMT	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15 (40)	20 (40)	20 (40)	(40)	(40)	(20-40)	(15) 20	10-20	10 (20)	10-17	10 (20)	(10) 20
South America	(15) 20	20 (40)	20 (40)	20 (40)	x	x	(15-20)	x	(10)	10 (15)	10 (20)	(10) 20
Europe	40	40	40	40	(40)	x	(10-20)	10 (20)	(10) 20	(15-20)	(20)	(20-40)
Southern Africa	(20-40)	(40)	x	x	x	x	x	(10-12)	10 (17)	(12) 17	(15-20)	20
Eastern Europe	(40)	(40)	x	x	(20)	x	(10-20)	(10) 20	(20)	x	x	x
Middle East	(40)	(40)	x	x	x	x	(10)	(10-15)	15 (20)	20	(20)	(20)
India	x	x	x	x	x	x	x	(15-20)	x	x	x	(20)
Pakistan	x	x	x	x	x	x	x	(10-20)	(10-15)	x	x	x
Far East	(15) 20	20	(20)	(20)	x	x	(20)	x	x	x	x	(10-20)
Southeast Asia	(15-20)	x	x	x	x	x	x	(10-20)	(10-15)	x	x	x
Australia	(10-17)	(15-20)	x	x	(20)	(30-40)	(20-40)	(10) 20	(10-20)	x	(20)	(10-15)
Alaska	15-17	20-30	x	x	x	20-30	20-30	15-17	15-17	x	x	15-17
Hawaii	(10) 15	(20)	20	(20)	20 (40)	40	(20-40)	(20)	(15-20)	x	(10)	10 (15)
Western USA	(10) 40	(15) 40	20-40	(20) 40	40	40	40	(20-40)	(10-20)	10-20	10-20	10-20

CENTRAL UNITED STATES TO:												
GMT	00	02	04	06	08	10	12	14	16	18	20	22
Central America	(15) 20	20 (40)	(20) 40	(20) 40	(20) 40	40	(40)	(10) 20	10-20	10-15	10 (20)	15-20
South America	(15) 20	20	20 (40)	20 (40)	(20)	x	x	x	(10)	10	10 (20)	(10) 20
Europe	(40)	40	40	(40)	x	x	(20)	(15) 20	(10) 15	(15) 20	(20)	x
Southern Africa	20	(20)	x	x	x	x	x	x	(10-15)	(10) 15	15 (20)	20
Eastern Europe	x	(40)	x	x	x	x	x	(10) 20	(10-20)	x	x	x
Middle East	x	(40)	(20)	(20)	x	x	x	(10-15)	(10-15)	(20)	20	(20)
India	x	(15)	x	x	x	x	(20)	x	(15)	x	x	x
Pakistan	x	x	(20)	20	(20-40)	(40)	(20)	x	(15-20)	x	15	(15)
Far East	x	x	x	x	x	(20)	20	(15-20)	(15)	x	(15)	x
Southeast Asia	x	x	x	x	(20)	(20)	20	(15-20)	(15)	x	(15)	x
Australia	(10) 15	15	(15-20)	20	20 (40)	20-40	20 (40)	(20)	x	x	x	(10-15)
Alaska	15-17	15-17	x	x	x	(40)	(40)	20	20	x	x	15-17
Hawaii	(10) 15	(15-20)	20	20	(40)	(20-40)	20 (40)	x	(15)	(15)	(15)	(15) 15

WESTERN UNITED STATES TO:												
GMT	00	02	04	06	08	10	12	14	16	18	20	22
Central America	(20-40)	40	40	40	(40)	x	(20)	(10) 20	10 (20)	10 (20)	(10) 20	(15) 20
South America	17 (40)	(20)	x	x	x	x	(15)	12 (20)	10-20	10-20	12 (40)	
Europe	x	x	(40)	(20)	(20)	x	(20)	(10-20)	(10) 20	(20)	x	x
Southern Africa	(20)	x	x	x	x	x	x	(10)	(15)	15 (20)	(15) 20	
Eastern Europe	x	x	x	x	x	x	x	x	x	x	x	x
Middle East	(20)	(10)	(20)	20	20	(20)	x	(15)	(10) 15	(10-15)	(20)	(20)
India	(15-20)	x	x	x	x	x	(20)	x	x	x	x	x
Pakistan	(10) 20	(15-20)	x	x	(40)	40	(40)	x	x	x	(10-20)	10-20
Far East	(15)	(20)	x	x	x	x	x	(20)	(15) 20	(20)	(10-15)	10-15
Southeast Asia	(10-15)	(15-20)	x	x	x	(20-40)	(20-40)	20	(15-20)	15	(10-15)	10
Australia	10-15	x	x	20-30	20-30	20-30	20-40	x	20	15	x	15-17
Alaska	(15) 20	(15) 20	20	(20)	(40)	40	(20-40)	(15) 20	15 (20)	(10-15)	10 (15)	(10) 15
Hawaii	(10) 40	(15) 40	20-40	(20) 40	40	40	(20-40)	(10-20)	10-20	10-20	10-20	10-20

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

January 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
			1 F-P	2 F	3 F-G	4 F-G
5 F	6 F-P	7 F-P	8 P	9 F-P	10 F-G	11 F-G
12 F	13 F-P	14 F	15 F-P	16 F-P	17 F	18 F-P
19 P	20 F-P	21 F-P	22 F	23 F	24 F-P	25 VP
26 F-P	27 F	28 F	29 F-P	30 F-P	31 F-P	

analysis programs available for your computer such as CapMan, GeoClock, PropLab, WinCap, VoaCap, and Beam Finder. They range in price from free to more than \$300, so there's something available for everyone's budget. You can find a review of many popular software titles on the Radio Netherlands Web site at [http://www.mnw.nl/realradio/links/html/software.html]. "73" and Happy New Year!

Band-by-Band Forecast

10 and 12 meters

Worldwide opportunities can be found from sunrise to sunset, but openings will be narrow due to our short northern days. Once again, southern Europe, the Middle East, and Africa should have reliable openings from sunrise through late morning. Central and South America will dominate these bands from mid morning through late afternoon of course, but the South Pacific and Asia should become fairly strong by sunset. Be sure to check the morning and evening gray-line paths for strong propagation into areas that aren't normally accessible at other times. Daytime short-skip will range from 1,000 to approximately 2,000 miles.

15 and 17 meters

As on ten and twenty, your openings will follow the sun and occur from sunrise to mid-evening. Southeasterly through south-westerly paths will be the strongest and most predictable but some northerly areas will begin to compete as the month progresses. Southern Europe should often be workable before noon but North Africa and the Middle East will be easier targets. Central Africa may also become readable just before noon but South African stations usually don't connect until after lunch. Pointing south, the Caribbean, Latin America, and South America should be a "no brainer" from just past noon into the evening. Look for traffic from the South Pacific, Australia, and Southeast Asia for a few hours after supper. Short-skip will average from 1,000 to 2,200 miles.

20 meters

Good DXing should be available around the clock. Look for peaks just after sunrise, during the late afternoon, and again in the early evening. Try Australia from sunrise to mid-morning, Europe from mid-morning through early afternoon, and Africa in the late afternoon. Central and South America should be open most times except around

sunrise. Asia and the Orient will only be available to night owls. Early risers might try long paths across the Antarctic into southern Asia and the Near East. Short-skip can range from 500 miles during the day up to 2,100 miles at night.

30 and 40 meters

Good worldwide opportunities can be found during the hours of darkness. Central and South America will be the dominant stations, but if you live east of the Rockies you may find Europe and the Middle East good territory between sunset and midnight. Operators in the western U.S. will find the best signals in Central and South America although the Middle East may be workable for a few hours around mid-evening. Japan and Australia will also be workable, but only during the hours when most of us in the U.S. are asleep. Skip distances will fluctuate between 750 and 2,000 miles at night and will be under 1,000 miles during the day.

80 and 160 meters

Good worldwide DXing may become available from sunset through sunrise, but high sunspot activity will continue to weaken signals. Easterners should find the best openings to Europe or North Africa from just after sunset to midnight. Mid-western operators will find the Caribbean and the Americas strong all night, while stations west of the Rockies will experience weaker openings both there and in the South Pacific or Far East. Expect skip to be between 1,000 and 2,000 miles at night.

NEVER SAY DIE

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to see medical journals publishing peer-reviewed papers showing a relationship between sonograms and growth restriction, delayed talking, mental impairment, dyslexia, and non-right-handedness.

Considering the current interest in sonoluminescence, it makes sense to me that ultrasound exposure should cause problems, particularly with neurons (brain cells). When water is exposed to ultrasound tiny flashes of light can be seen. These are tiny explosions as bubbles are compressed by the sound waves to the point where they are heated to thousands of degrees and explode. I've published technical articles on this phenomenon in my *Cold Fusion Journal*.

Is this what we want happening to fetuses? Brain neurons which are destroyed during sonograms will never be replaced.

It's no wonder that all kinds of abnormalities are popping up later ... such as delayed speech development and mental impairment.

Gee, am I surprised? Not!

When the book *Dianetics, The Science of Mental Health*, came out in 1950, I immediately got a copy. The theory made sense to me, so I got together with Joe, a fellow announcer at WSPB, and tried it out. The book claimed that traumas, even during pregnancy, could affect people's lifetime behavior.

We started with Joe's having to switch off his mike to cough every time he had to make an announcement. When I regressed him to the origin of this problem it turned out to be two months before his birth. His mother had a bad cough and every time she coughed it was painful for little Joe, so the pain was equated to what he was hearing and feeling at the time. Under hypnosis I ran Joe through the subconscious memories of these pains to decondition them. Joe no longer had to cough when announcing. I wrote down his mother's words, which were automatically recorded by Joe when she coughed. The critical phrase was, "Every time I get nervous, I cough." So, 25 years later, Joe was coughing whenever he got nervous.

When Joe's mother visited, I checked the things Joe had "remembered" her saying and she confirmed it all.

I was so impressed by this experience that I quit my job at the station and went to the Hubbard Dianetic Research Foundation in New Jersey and took a six-week course to improve my auditing skills.

I confirmed that the things that happen to a baby during pregnancy can affect the child's life significantly. Several cases I audited were solved by deconditioning prenatal trauma memories.

With that background you can understand why I have been opposed to sonograms. I felt that those would have to be traumatic to the baby and could easily leave their mark on its life ... and that's not counting the exploding of the baby's brain neurons and any damage to the DNA.

Why take a chance on lowering the baby's IQ?

Fatso

30.5% of Americans are obese and 64.5% are overweight. And this accounts for the \$117 billion a year spent on obesity-related illnesses, plus about 300,000 deaths, second only to tobacco. The food industry knows what it's doing when it spends \$33 billion a year to encourage us to eat more.

We're eating more and getting bigger portions. Muffins, which weighed an

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average of 1.5 ounces in 1957, now average a half a pound each! McDonald's fries used to be 200 calories vs. today's 610 calories super-size fries. In 1970, we drank an average of 22.2 gallons of sodas a year vs. 56 gallons now. Half of the schools now have exclusive contracts with the soft drink makers — and a nice payback for the exclusivity.

And so it goes, with more and more schools contracting to have fast food companies sell in their schools.

Kids were hit hard during the Saturday TV shows when they were exposed to an average of 225 commercials. By 1995 this was up to 997, with two-thirds of those promoting foods of little nutritional value. Kids aged 2 to 18 now spend an average of over five hours a day in front of the tube. And, wow, are they fat!

Big Brother

With our prison population now at two million, mainly thanks to Congress's support of the lucrative illegal drug industry, high tech is finally going to replace the counting of heads eight times a day system for keeping track of prisoners. It's about time!

Twenty years or so ago I proposed that we farm out our prison business to countries where the costs would be lower to house and feed our miscreants. Further, instead of building maximum security facilities, I proposed that the prisoners wear a wristband which would make it so the prison would know exactly where anyone was at any time.

I also proposed that the prisoners be fed slop (actually, probably the same as most are being fed right now), but given the opportunity to grow their own food ... fruits, vegetables, chickens, pigs, cows, etc. Like a large farm.

This could cut the cost of our prisons by around 90%, plus teach prisoners the value of work and cooperation.

Now I see that Illinois has signed a \$3 million contract with Technology Systems of Scottsdale to outfit a prison with a tracking system. The wristbands would send a serial number every two seconds showing where the prisoner is. The system would alert guards when a prisoner got close to a perimeter fence or spent time with a gang member or a rival. It would also prevent prisoners from doubling back on the chow line.

My proposal also included making 24/7 audio recordings of each prisoner. These could be saved for only a day or two unless something happened where the recording might be of value.

By locating prisons in Chad or Jordan, it would make it so there's nowhere to

go if someone does try to escape. When I gave a talk to the hams on Guam I suggested that their island might be ideal for such an industry. It's remote, making escape very difficult. And when you plant a seed there you have to jump back quickly it grows so fast. The hams loved the idea.

The next step, of course, would be to have the employees of bigger companies wear the wristbands. Then, perhaps, kids in school. Hey, where will this end?

Lawyers

As Shakespeare said, "First, kill all the lawyers." Despite my losing a few friends in the process, and the problem of moving thousands of tons of bodies for burial to Nevada, along with the radioactive waste, it could clear up a lot of our problems and enormously improve our personal financial situations. It would also pretty well clean out Congress, which is almost justification in itself for the project.

On the positive side, this could provide a source of organ replacement parts for people who have destroyed their livers, hearts, and so on through really lousy nutrition, dehydration, and ingesting toxic substances.

Tort reform? When this is a zillion dollar industry with the fox running the hen house? Snicker.

Michael Freedman reported recently in *Forbes* that 42% of obstetricians are leaving the Las Vegas area now that 76% of them have been sued, 40% of them, three or more times!

You want to know why we have so many lousy teachers? Because it's so difficult and expensive to get rid of the rotten apples. In New York State it costs an average of \$194,000 in legal bills to terminate a teacher. In Detroit it's a seven-year process.

Now, where do you think all of the money is coming from to pay for these law suits, settlements and awards? We're all being shaken down. It's we suckers who are paying for the most expensive and least productive school system in the developed countries. And ditto our sickness care system. All of us have to pay when a McDonald's customer spills coffee in her lap and sues. And we have to pay, one way or another, whether she wins or loses.

Are we totally helpless pawns in the escalating extortion, or is there something we can do about it?

Hell's bells, just go to step two in your thinking. If lawyers are feathering their nest with laws made by lawyers we have elected to state legislatures and Congress, then STOP electing these buzzards. Never, ever, contribute one dollar to a lawyer's election or re-election campaign. Ever! Whenever a lawyer runs for any

office, get out there and do everything you can for his opponent, even if he's a ... a ... Democrat.

If we can't legally kill 'em, we can at least stop letting them take us to the cleaners by electing businessmen who will start undoing the mischief the lawyers have done.

GM Worry Wart

With genetically modified food creeping more and more into our food supply, I'm worried. If you've done much reading on the subject (which I seriously doubt), you know that GM foods are tested on mice. By the company making the seeds, not by the government. The bottom line on this is that the big companies have a long history of cheating to the max on food and medicine research in order to keep those quarterly profit figures booming. The small companies would, too, if there were any of them left.

What are the possible long-term "side effects" of humans eating genetically modified corn? No one has a clue. But I'll bet the brass at Monsanto isn't eating any. Considering the long list of drugs that the FDA okayed and then had to have pulled from the market after the side effects became no longer hideable, I'm siding with the Monsanto brass. The whole process is corrupt and, as usual, we're the patsies.

The BBC reported that a lab experiment on chickens fed GM maize (that's corn) in 1996 resulted in twice as many chickens dying as the control group fed on conventional maize.

Then we have the Monsanto suit against Percy Schmeiser. It seems that pollen drift from nearby farms using Monsanto seed crops got into his canola crop, so Monsanto sued him for violating their patent ... and was awarded about \$100,000. Monsanto held that Percy should have known that the patented pollen had reached his crop and notified them to come and get it.

The USDA says that this year 74% of the American soybean crop and 32% of the corn crop will be from GM seeds.

Well, if the terrorists or Planet X don't get us, maybe Monsanto will.

Don't Blame Doctors

In my estimation the medical/pharmaceutical/HMO industry is one of the big scams ... right along there with our government-run public school system and Congress.

But I don't blame doctors for not knowing what's going on. They're brainwashed in medical school and never even hear about alternatives. I'll bet not one doctor in a thousand (maybe ten thousand) has

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$10 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively — once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories — where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschall's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

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Colloid Reprint. April 97 article on a silver colloid maker, history, and how to use the stuff. \$5 (#98)

Colloid Clips. Three 9V battery clips, 2 alligator clips & instructions. \$5 (#99)

AC-powered Colloid Kit: 12V power supply, silver wires, reprint, including priority mail shipment. \$37 (#82)

Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry: Schools in 2020: another \$ trillion industry. Anthrax, a simple cure. Dowsing: why and how it works. \$3 (#86)

My 1992 We The People Declare War! On Our Lousy Government book—360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need: **NASA Mooned America:** René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs — such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was \$7. I found a few in the warehouse. \$3, while they last. Great book! (#83)

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Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the March 2003 classified ad section is January 10, 2003.

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NEUER SAY DIE

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read the books by Dr. Melvin Page, Dr. Weston Price, Dr. Henry Bieler, Dr. Bruno Comby, or Dr. Guylane Lancôt (they're reviewed in my *Secret Guide to Wisdom*).

They're all taught to "treat" symptoms with prescription drugs, shots, or surgery.

Like us, they never hear about the work of the above doctors from the media and, even if they bothered to read the medical journals, they wouldn't learn anything about alternatives. The medical journals depend on pharmaceutical company advertising and aren't about to kick billion-dollar gift horses like that in the err ... slats.

Water, Water

With 75% of Americans chronically dehydrated, the odds are that you're one of 'em. So what? Well, the lack of water is the #1 trigger of daytime fatigue. How about back or joint pain? It only takes a 2% drop in body water to trigger short-term memory loss and difficulty in concentration. Five glasses of water a day decreases your potential for colon cancer by 45%, breast cancer by 79%, and bladder cancer by 50%.

By water, I'm not referring to that sewage from your faucet. Drink distilled water, and drink a lot more of it. The excess will pass.

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Here's Lookin' at Ya

Let's turn our eyes toward the planet Venus. Just our eyes. Not our telescopes. Because if we do use a telescope we might make the very same mistake made by a very famous astronomer regarding canals on that mist-shrouded planet.

Turn-of-the-(last)-century astronomer Percival Lowell is well known for promoting the incorrect notion

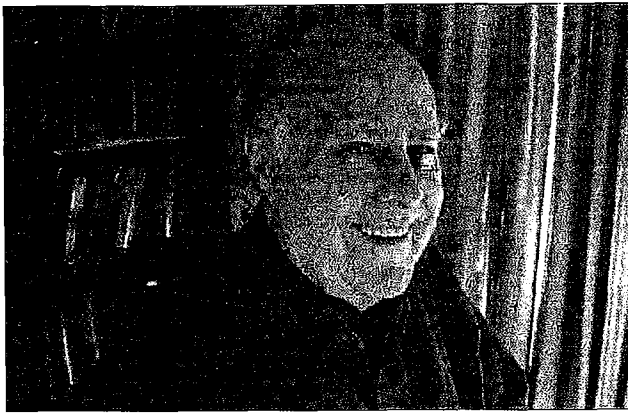
that water canals had been built on the surface of Mars. He also drew a map of the "canals" on Venus: the only problem was that no one else could see anything resembling canals, because Venus is always covered by clouds.

Turns out that Lowell had narrowed the aperture of his 24" telescope down to about 3" to attenuate

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Wise Up & Beat the Odds

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What's Going On?

Something's out of kilter. We're having more volcanoes erupting today than ever in history. We're having more earthquakes. And the Sun is having the longest and most intense sunspot period in history. Why, it's almost enough to make even a scientist think. But, not quite.

The scientific establishment in every field tends to be almost totally immune to new ideas or investigating anomalies. Always has been.

So, what's going on? The idea that Planet X will be coming along in May and destroying civilization is patently absurd. Yes, the government is still covering up Amelia Earhart's disappearance, even after 65 years. And President Roosevelt's masterminding the Pearl Harbor attack for 61 years. And the Roswell UFO crash for 55 years. And the faked Moon landings for over 30 years.

I wouldn't be such a worrywart about the whole X deal if what's happening wasn't exactly what Nancy Leider (*Zetatalk*), Mark Hazelwood (*Blindsided*), and several others predicted would be the results of Planet X nearing. Well, by next month X should be easily seen. Or totally dissed.

Hmm, got your QRP rigs tested and handy?

A Major Publisher

Many readers of my *Secret Guide to Health* have been pushing me to get a major book publisher to help market the book ... complete with

book tours and TV interviews. I'd sure like to help millions of people be healthy instead of only thousands, but I'm worried that the impact could cause an even worse recession than we have now.

You see, if the word ever really gets out about what I've discovered it could: Put tens of thousands of doctors out of work; close down two-thirds of our hospitals; put almost all assisted care facilities out of business; close down most nursing homes; bankrupt the pharmaceutical companies; severely impact drug stores; put most medical schools out of business; severely depress the funeral business; bankrupt the food industry giants; destroy the sugar industry; put most dentists out of business; and dental schools; bankrupt the soda pop industry; bankrupt the tobacco industry; bankrupt the beer, wine and liquor industries; put a million liquor stores out of business; wipe out cancer and other illness-related research organizations; destroy the Social Security system as we know it; wipe out HMOs; wipe out the health insurance industry; wipe out the fast food industry as we know it; put Kleenex out of business; bankrupt the TV networks.

Just think what something like this could do to the American economy. And then Europe and around the world. Icons like Coca Cola and their hundreds of thousands of workers would be history. Ditto McDonald's, Starbucks, Dunkin' Donuts, Pizza Hut, Burger King and Wendy's

(unless they bring back their salad bars).

Let's say you're a small employer like I was a while back. I had about 250 employees. Today I'd be paying about \$1 million in health benefits for them. Next year it would be \$1,125,000. Would I buy 250 copies of my health guide at \$20 a whack, a \$5,000 outlay, in the hopes of cutting my health care bills? In an instant. Further, I'd blow another \$10 for a video of Wayne Green explaining the benefits of changing one's lifestyle. I'd also get rid of the candy and coffee machines in the employees' lounge. I'd replace them with bowls of grapes, cherries, apples, etc. Oh, and water coolers with big bottles of distilled water.

A bigger company's CEO, with 10,000 employees, faced with spending \$40 million a year on health benefits (which have been lately going up at about \$500 a year per employee), might be interested in investing \$120,000 (bulk discount) in my books to help his employees be healthier. If not, his board of directors should fire his ass because the savings would go right to the bottom line, increasing the company's profits (and its stock price).

Would corner bars like Cheers and Moe's be replaced by sashimi bars? I sure hope so.

So, do you know any publisher interested in a book which could be the biggest seller yet? In 50 or so languages?

Treatments

The media brainwashing continues. Didja see the *Newsweek* Special Report on medicine's next frontiers? Twenty-nine pages of the issue had to do with treatments for illnesses our scientists are working on. Well, bless their hearts for their great pharmaceutical company work. But, in all that coverage I didn't see any hint about why we get sick and how, maybe, we can actually prevent it.

Yes, I know, I'm like a broken record. I keep trying to get the simple, commonsense message across that when we give our bodies the fuels they're designed to use they aren't going to get sick and need treatments. Hamburgers and fries with Diet Coke are not what our bodies are designed to cope with. Nor coffee and doughnuts. They're slow, addictive poisons.

The L.A. Riots

Well, it was ten years ago when the blacks rioted over the acquittal of the police who so brutally beat Rodney King. Hey, how come the jury did that? I'll bet you've never heard the real story. I know I hadn't.

The acquittal was the result of the jury seeing the entire videotape of the event, not just the little segment shown endlessly on TV. Yes, the news shows had the whole tape to work with, but showing the whole thing wouldn't have been as shocking (newsworthy).

Continued on page 8

continued from page 1

the bright light from Venus. That little known fact — recently publicized — caught the attention of optical experts, who realized that Lowell had unwittingly turned his telescope into a reverse ophthalmoscope, an instrument used to examine the interior of the eye. Instead of mapping the surface of Venus, Lowell was apparently mapping the shadows of blood vessels and other structures on his own retina!

Sky & Telescope magazine explained the situation in detail, presented Lowell's sketch of the Venusian "canals," and a photograph of retinal blood vessels. The two patterns are strikingly alike.

You can see the pictures in the on-line edition of *Sky and Telescope* magazine. Just take your Web browser over to [<http://skyandtelescope.com>].

Thanks to Q-News Australia, via *Graham Kemp VK4BB*, via Newsline, *Bill Pasternak WA6ITF*, editor.

What If?

A cell phone call from a friend. A beeper message from the boss. Justin Timberlake on the radio. 24/7 news on CNN. Each is an everyday, "wireless" event in our lives, usually unworthy of a second thought.

But what if the radio revolution had not occurred? What if Guglielmo Marconi had not lit the spark of global communication on the cold and windswept cliffs of Cape Cod a century ago? How would we communicate today? Would wires still tether us?

The National Park Service at the Cape Cod National Seashore celebrated the 100th anniversary of Marconi's first transatlantic, wireless broadcast from the U.S. on January 18th, with a daylong series of public events designed to showcase the historic and pioneering nature of the event.

"What happened January 18, 1903, at today's Marconi site in South Wellfleet changed people's lives forever," said Superintendent Maria Burks. "Its historical significance rivals the Wright Brothers' first flight."

Working with local, regional, and national celebration partners, the Seashore hosted public events that attracted visitors from all over. The events included a NASA-sponsored, family space education program; weeklong, worldwide radio communication sessions hosted by the Marconi Radio Club and other amateur radio enthusiasts; and special Marconi presentations at the Seashore's Salt Pond Visitor Center.

"There was something for everyone — from school kids to philatelists to scientists and historians," said Burks. "We told the story of one man's innovation and perseverance, his disappointments and triumph, and the lessons they hold for us today."

The event

Using four wooden transmission towers erected on a steep cliff overlooking the rolling Atlantic, the 28-year-old Italian-born inventor set out to prove in 1903 that man could communicate across a vast distance without the wire-based technology of the 19th-century telegraph.

Michael E. Whatley recounted the momentous night in his 1987 publication, *Marconi - Wireless on Cape Cod*: "The air was literally charged with high voltage. Finally, Marconi went over to the wireless telegraph key. Within four minutes it was done. The message had been tapped out, and transatlantic radio communication between the U.S. and Europe was no longer an experiment: it was a reality."

"To His Majesty, Edward VII, London, England," read the message signed by President Theodore Roosevelt. "In taking advantage of the wonderful triumph of scientific research and ingenuity which has been achieved in perfecting a system of wireless telegraphy, I extend on behalf of the American people most cordial greetings and good wishes to you and all the people of the British Empire."

Later that night came the King's response to Roosevelt: "I thank you most sincerely for the kind message which I have just received from you, through Marconi's transatlantic wireless telegraphy."

Whatley wrote, "The triumph was Marconi's alone, and the publicity (was) astounding." The messages appeared on the front pages of *The New York Times* and *Boston Globe*, and congratulatory telegrams "kept the Cape Cod (radio) operators in turmoil."

The legacy

In the ensuing years, as radio, TV and space communication thrived, the old Marconi station was dismantled, and the site fell into disuse. The ocean ate away at the cliffs where the towers stood. In the '60s and '70s, the National Park Service restored the venue as the Seashore's Marconi Site, salvaging remnants of a tower's base and erecting an exhibit shelter and viewing platforms.

Now the Park Service and the Seashore are able to celebrate the achievement of the man who was honored in 1909 with the Nobel Prize and who, when he died in 1937, was honored the world over by two minutes of radio silence.

Thanks to *Jane and Chip Bishop of Chip Bishop Communications, West Dennis MA*.

Why Is It?

There are a lot of strange and interesting things that happen in our wonderful hobby. Working the World QRP. Making effective antennas out of practically nothing. Catching rare DX when you least expect it. Things like that. But there

are other things that can be frustrating to every ham worldwide (especially me). Things that make you go hmmm ...

One-way propagation: Why is it that at times you hear a station on the air that you would REALLY like to work, and they're practically blowing your headphones off, but they CAN'T HEAR YOU!!? It's the wonderful phenomenon known as "one-way propagation," also known as "I can hear the *&\$@!, but he can't hear me!!" As I've found out, banging your head against the desk (nearest tree, car, cow, etc.) doesn't help to put your signal forth any stronger. Screaming into the microphone at the top of your lungs doesn't get it, either. Indulging in these activities will allow the XYL to prove once and for all that the last speed-dialer button on the phone is really for the nearest mental health response unit, and not Pizza Hut, as she has always claimed!

Birds: Why is it that when you have a nice multiband vertical looking pretty out in the yard (like mine — the vertical, not the yard!), birds always want to perch on the whip of the uppermost section, and then scream at you about the bumpy ride and suffering motion sickness? With 10 million trees around, they always seem to find antennas better landing strips. And why is it that when you're out there tuning the antenna (and possibly offering more stability to their ride), they give a personal demonstration of toilet marksmanship? Things like this that happen are frustrating. The neighbors are sure to complain that you're "out to hurt the little birdies" with that big bad slingshot, instead of just trying to get a wire antenna up into the trees (personal tip: keep the steel shot in your pocket until you're ready to use it — it's less conspicuous that way!).

Kids: Why is it that kids find coax cable so fascinating? The neighbor kids were making quite a racket in the back yard a few weeks ago. When I went out there to investigate, I found them trying to kill "the long black snake trying to eat the metal tree you have" (i.e., my poor old vertical) by snapping the coax around like a bullwhip, trying to break its neck! Thoughtful neighbors are great, but I find that it's much easier to make contacts via ham radio if the snake continues to eat the metal tree. I'm glad they didn't see where the other end of the snake went, because to see a snake pass a mobile home out of the other end probably would cause irreparable damage!

Neighbors: Neighbors can make or break a neighborhood — hence the term "neighborhood." Living in a mobile home court, neighbors frequently come and go. It is because of neighbors, however, that I found out what "front-end overload" is. This is an interesting phenomenon whereby a strong signal overwhelms reception of desired signals. It's also responsible for freaking out non-English-speaking neighbors as well. I found out from my next trailer neighbor (well, it IS a mobile home court) that my CQs on 20 meters were making the CD tray on his stereo go in and out spontaneously. I also

found out that I was the "English-speaking demon line" in their TV set! They were able to deal with this pretty well, but a visiting relative from Mexico wasn't so receptive. She wound up screaming on the way to the rear bedroom that the TV was possessed. I exorcised the demon from their home by relocating the antenna to the back yard instead of the side one. After all, if I hadn't moved it, the kids out back wouldn't have had a long black snake to kill.

Ham shacks: Why is it that we all brag about the "shack" as being a huge, well-equipped place where we have a gigawatt of power at our disposal and equipment made from the rarest, most exotic materials, and from whence we can talk to anyone in the world anytime we want to? Some of us probably can. I'm one of the more common hams: My shack is the southeast corner of my living room. I'm also a slave to propagation. Ahhh, the wonder of "sporadic E". Sporadic E is literally a cloud of highly ionized atmosphere in the E layer that allows for long skip to occur. More than once I've had the pleasure of the band dropping out (the sporadic E cloud moving on or dissipating) during a QSO, only to turn over the frequency to dead air! That's very frustrating — especially when another ham hears both sides of the conversation and then lets you know that the other party went out to lunch thinking it was all over! ARRRGGGHHH! It happens.

Lingo: The "slang" of ham radio. Everything

has lingo with it, as do we. Some of the lingo can be frustrating, too. Such as "foot-warmer." To some ops, a foot-warmer is a linear amplifier. I have a foot-warmer, too. It answers to "Calico," and ruins bags of kitty litter! Lid is another one. Common term: A lid is what keeps food in a jar from spoiling. Ham lingo: A lid is someone who NEEDED a lid to keep them from spoiling everyone else's on-air time. You know what I mean. Lastly, log sheet. Why do they call it a "log sheet"? They're not nearly big enough to use as a sheet for a log unless it's really small and short. Why anybody would want to sleep on one is beyond me, anyway.

Mobile operation: Working the world while motoring down the highway is a wonderful thing. It's not a wonderful thing, though, when antenna mishaps occur. For example, I set up my trusty old Kenwood TS-180S in my Chevy Astro van as a mobile rig. A friend said that he'd had great success with Hustler resonators mounted on a mast, which is in turn mounted on a spring-loaded bumper mount. I bought all of the items necessary to share in his success. After mounting the antenna mount to the bumper (while my XYL glared at me while I made the holes), and the antenna mast and resonator, I was set to check the SWR and "go mobile." Everything looked good, so I headed out on Interstate 70 to try some 75 meter mobile phone. A slight oversight by my friend: As I achieve the 70 mph speed limit, I experience a loud "thumping" in the rear of the

van. Hmmm. I look into the side mirror to check out the noise, and discover that my awesome spring-loaded, bumper-mounted antenna is doing a live demonstration of how a sledgehammer should properly be swung! Yow! Oh the sight, friends, of seeing almost \$200 of antenna bouncing off of the highway, only to fly up and dent the back end of the van. You haven't lived until that happens. Is there ANY chance he might have forgotten to mention guying the antenna before take-off? Frustrating, you bet!

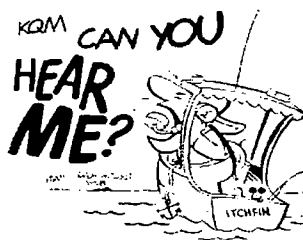
There are as many frustrating things about life in general, as there individuals to experience them. I'll bet you could think of a few things that made you want to turn a trusted HT into an aero-mobile! Or the day when you get the coveted "Worked All Neighbors" award! Things that are unexpected, and yes, frustrating. But we all manage to deal with them in a positive manner, and often learn valuable things along the way. Be proud to be a ham. Help others with our hobby. Enrich the vocabularies of those around you when things are bad — somebody has to do it, right? After all, when the chips are down, the ham will come shining through, providing emergency communications when needed, being active in the community, helping others. It's the ham way.

Thanks to Dewey E. Boss NØZYG, 1661 W. Republic Ave. Lot #26, Salina, Kansas 67401; [dboss@cox.net]; [www.geocities.com/SiliconValley/Park/3395].

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Illustration from the original SGC Smartuner S801 feedback, 1974



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NEVER SAY DIE

continued from page 4

If you've watched any of the cop shows you know that suspects are often ordered to lie on the ground with their hands behind their backs. Cops have found by hard experience that this is the safest way to keep from getting shot or stabbed.

When, after a high speed chase, King was finally stopped and ordered to lie down, he refused. The other men that were in the car with him all complied and gave no trouble. When the cops tried to force King down he fought them. He was too big and strong for them, so they tried electrified darts to immobilize him. They didn't faze him. Twice he got back up and charged the cops. When they finally managed to get him down he wouldn't put his hands behind him and was still struggling to get up. It was the last few seconds of their efforts to subdue King that the media showed. And showed.

When the jury saw the whole tape they acquitted. More than 50 people lost their lives in the ensuing riots.

The media may have our attention, but it doesn't make much of an effort to be honest.

How much have you seen in the mainstream media about the reality of cold fusion, UFOs, crop patterns, and so on? I guess these things just "don't sell papers."

College Grads

Okay, you are now "formally educated." But that doesn't mean you've learned much of practical value to your career. Or, have you really had a career in mind? Or have you just been going with the flow?

Your college teachers, with very few exceptions, are people who've never worked in the business world. They've forced you to memorize the same stuff for quizzes that they had to memorize when they went to college. Stuff out of pretty much the same textbooks.

With the job market for grads in the pits these days,

just sending out résumés, no matter how creative and exaggerated they are, isn't working.

The free ride on your parents is over. Or, worse, you've gone thousands of dollars in hock to get that degree. Either way, you're now expected to enter the job market and start making money on your own.

It's almost time to start giving some thought to building a career. So, what's it going to be? You're now facing one of the most important choices in your life. One that you postponed four years earlier when you opted for college. Now, you have to make a major choice. Will it be a job? Or back to school for an advanced degree, putting off that career decision again?

If you keep doing this you'll end up a professor with students short-term memorizing the same stuff for quizzes that you did.

Fast Food

How come it takes me twice as long to eat as everyone else? Because I'm the only one taking the time to actually chew my food. Everyone else chews their food just long enough to be able to swallow it, and then washes it down with ice water, tea, cola, wine or a malt.

Around a hundred years ago, when Dr. Kellogg did the research, he found that a big part of the digestive system lay in the saliva action while chewing food. He recommended that every bite be chewed one hundred times before swallowing. For a while he had several million people actually chewing their food. He didn't do us any favors when he brought us corn flakes and other cold cereals.

Now, about that stuff you've been drinking while eating. That liquid goes to your stomach and dilutes the acid bath your stomach needs to dissolve the food so your intestines can get the most out of it.

Well, considering the junk people are using for food, maybe it's best that it go through the digestive system with as little absorbed as

possible. Twinkies, genetically modified potatoes deep fried in canola oil, well done beef loaded with growth hormones and antibiotics, Krispy Kreems, Orcos, etc. You get the picture.

Raw Meeeat?

Raw meat. That's mmm-eat.

When people read my *Secret Guide to Health* and discover that cooked food is considered by our immune systems as toxic, and that this includes meat, they're ready to go vegan. Raw meat? Ugggh.

Never mind that our ancestors were hunter-gatherers who ate raw meat for thousands of generations. Or that the Eskimos, who used to be very healthy, lived totally on raw meat.

I enjoyed reading an article by a chef who explained that any customer who ordered his meat well done got the oldest and cheapest meat served to him. The finest cuts were saved for the "very rare" or "blue" customers.

Steak tartare is a favorite in France. That's raw hamburger with capers. Delicious. And with fondue bourguignonne one dips cubes of raw meat into hot oil at the table. I've always dipped mine just for a few seconds.

I'll never forget a fantastic fondue in a little cabin up on top of the mountain at Vail, where the local ham skiers were celebrating a birthday. They had cubes of steak, moose, and elk. And, at that height, the fondue oil didn't get hot enough to cook the meat much. I loved it!

The transition from 70% raw to 100% hasn't been difficult for me, though I do still cheat with liver, which I sear for about three seconds on each side. It's about 98% raw and fabulous. I like it much better than steak.

At my age, after almost 80 years of beating the hell out of my immune system, I need all the repairing ability my immune system can manage.

Smallpox

If the recent revelations about the serious dangers of

flu shots hasn't cooled your enthusiasm to line up for a smallpox vaccination, it's time to stop believing the major media and politicians, all well under the control of the pharmaceutical industry, and do some homework. At least read Walcen James' *Immunitization, The Reality Behind the Myth*. That'll slow you down. It's reviewed on page 7 of my *Wisdom Guide*.

A recent article in *Time* tells us that the smallpox vaccine "is one of medicine's most dangerous." About a third of those vaccinated get sick enough so they miss work or school. Pregnant women, small children, anyone with a suppressed immune system or eczema, are in more serious danger. Considering your diet, how strong do you think your immune system is?

Only a small percentage actually die from the vaccination ... an acceptable loss ... unless one is your child. "Gee, sorry about that."

Maybe you've heard that some Russian scientists figured out how to modify the smallpox virus so it would be able to get around any known vaccine ... and that one of them was brought to Iraq by Saddam ten years ago to help work on his germ warfare development team.

Johnny Can't Fail

The No Child Left Behind Act has the state educational departments hustling to set their proficiency goals so low that, like Wyoming, not a single school in the state will fail. Naturally, the new law is seriously underfunded. As new tests are devised we'll see schools reacting in the time-dishonored way: teaching to the new tests.

The government mandates force all kids into fixed curriculums, allowing the kids no discretion. Is it any wonder that creativity and initiative are so thoroughly squelched in our kids?

The government wants every kid to be educated exactly the same. Cookie cutter approach. Beehive. I don't see

Continued on page 42

Cheap & Easy Portable HF Vertical

Try this medium-weight, sturdy, neat, visually pleasing, fun to use ...

Antennas are the most important part of an amateur radio station. You don't believe it? Try getting on the air without one!

Many portable antennas have been configured and described in the various amateur radio publications, throughout almost the entire history of amateur

radio. This project is what I like to think of as a "better mouse trap." I've tried the various methods of winding wire on a bamboo pole (and similar wood dowel types) sitting upright in a Christmas tree stand for a base, an automobile wheel sans tire, or a patio table umbrella base. Well, they worked!

Sort of.

But, those "lash-ups" left much to be desired, in terms of being portable, sturdy, and easy to use! A "mobile whip antenna" mounted on a microphone stand, or a music stand, or a camera tripod — we've tried. All! Didn't work as well as the bamboo pole, wood dowel method, although they were a step in the right direction mechanically.

The idea to use a speaker stand came while I was browsing through a flyer I received one day from Parts Express. (They have a Web site.) Parts Express is an electronic component and parts supplier located in Springboro, Ohio (south of Dayton). At the top of the one page of the flyer was the word "SPECIAL." Below it: "TRIPOD SPEAKER STAND!!!" It didn't take long for the idea to sink in that this is what I've been searching for, searching,

every whiiiiich way! Lawd, I've been searching — just like the Northwest Mounted, you know (remember that tune??).

Hmmm ... back to the subject at hand, this impossible ideal (dream) antenna — there were times I thought of Don Quixote. Special Price! \$29.50, it said (with a carry bag, too).

Well, to make a long story short, I got one (a speaker stand that is, **Photo A**). I happen to have a Radio Shack antenna mount that I bought when I was experimenting with the different "simple antenna" projects, and with some slight modification of the antenna mount, I put together the device shown in the pictures.

The good news?. This system works, and is no biggie to put up and take down! Also, it's cheap (in the "bang-for-the buck" meaning of course)!

I assume that just about any of the mobile whip antennas out there can be used. I happened to have Valor Pro-Am types of whip antennas for 80, 40, and 20 meters. They "tuned" after adding capacitance. The need for adding capacitance, I found, was that the Valor-type antennas are tuned for the phone part of the band. That's what

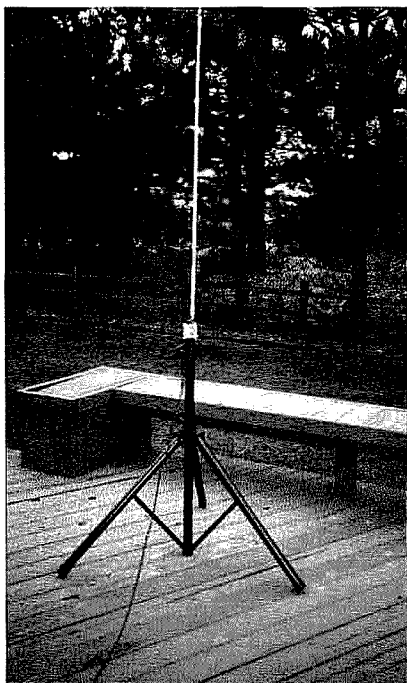


Photo A. The Cheap & Easy Portable HF Vertical securely mounted on a speaker stand.

they are designed for, and the addition of a capacitive "hat" (or increasing whip length) is required if operation in the CW portion of the band is desired.

I found that increasing the length of the stainless steel whip part of the antenna would work, as well as the adding of capacitance for lowering the antenna resonance point. Adding a capacitive hat has advantages over just lengthening the stainless steel whip. Hy-Gain antennas (mobile whip-type), as far as I know, can be tuned across the entire band selected for operation, by adjusting the whip length, and they would probably be the better choice.

Anyway, some tuning will be necessary if you need to work in the CW portion of a given band, no matter what brand of antenna is used. It would be good to consult an antenna book that covers mobile antenna operation, for suggestions that could be used to optimize performance. The only "serious" problem I've had so far is that the 10-meter antenna I have, a no-tune type wound on fiberglass with no whip, would not resonate at all. I even tried a straight quarter wave whip; no soap. My gut feeling is that 15 meters is about the upper usable limit of this "lash-up!"

The capacitive hat was made using

#14 copper grounding wire, available at most hardware stores; see **Photo B**. The thought has occurred to me to use an aluminum throw-away pie pan cut to the appropriate size using experimental methods, although I haven't tried it yet. The one advantage a wire hat has is that it has a smaller wind-loading co-efficient. The dimensions of the wire hat in the picture are 12" x 12" corner to corner. A disc-shaped unit would work as well, about a foot and a quarter in diameter. Increasing the number of cross members of the capacitive hat increases the capacitance in small increments, and is a good way to fine tune the system. This

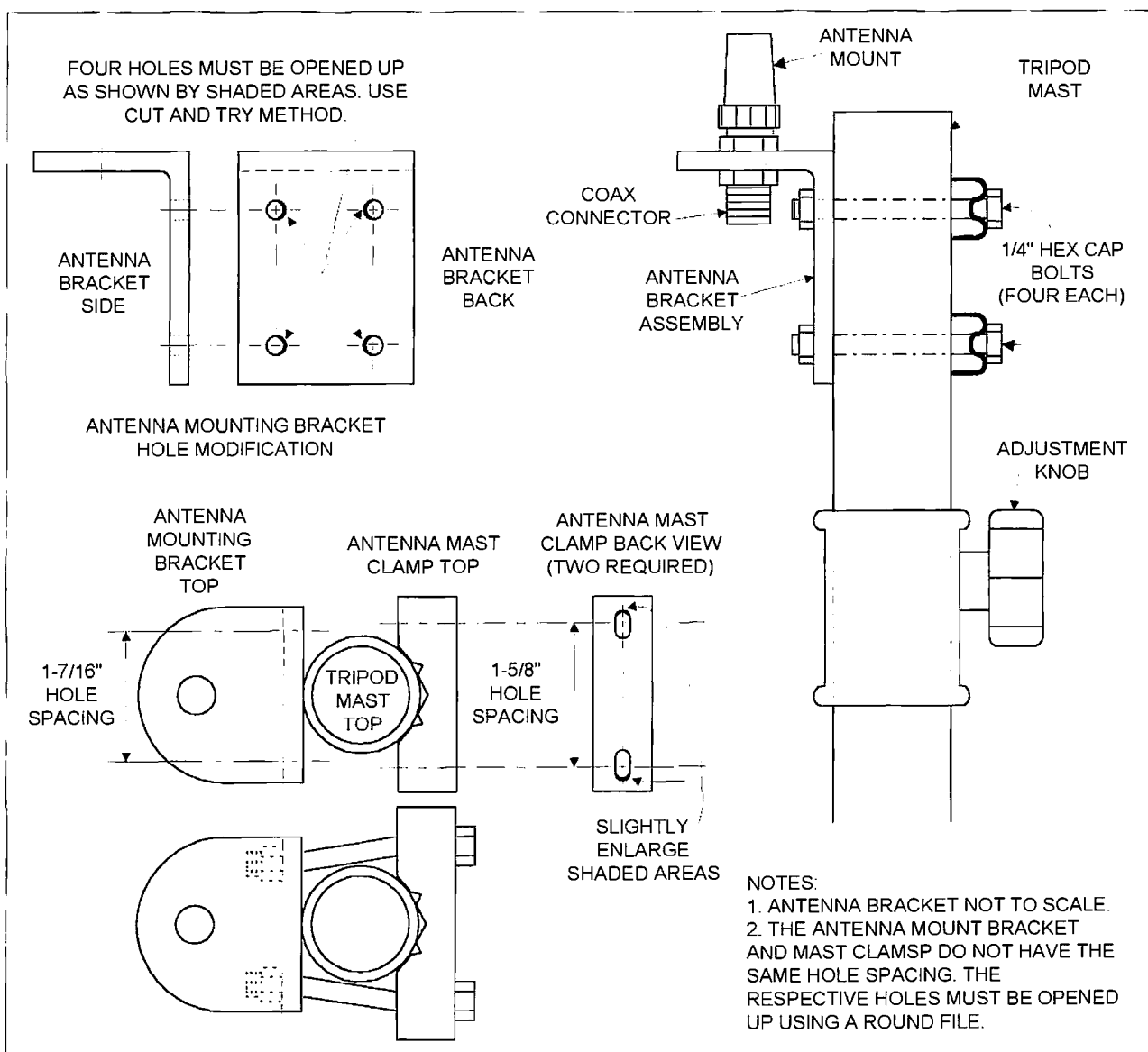


Fig. 1. Cheap & Easy details.

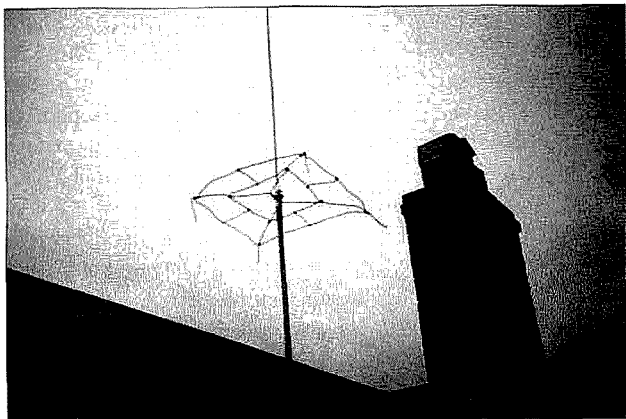


Photo B. The capacitive hat is made of #14 copper grounding wire.

system stood up to 30-mile-per-hour wind gusts, and only mildly swayed to and fro.

The tripod itself is easy to open and close, and can be easily tightened securely. The specs say that this speaker stand can safely support a 100 lb. load six feet above the floor. I should think that that's sturdy enough to handle any mobile whip antenna available. So if you're interested, the speaker stand catalog number is #245-010.

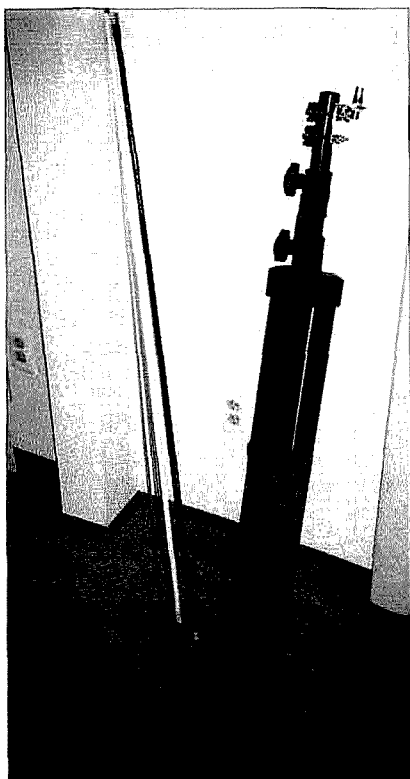


Photo C. This collapsed unit is easy to grab and go.

The on-special price was \$29.80, down from \$44.95; list price, \$109.95. It weighs 6-1/4 lbs., is easy to store, easy to transport (the ad says that). When collapsed it measures three feet tall — that is also the antenna operating support height (**Photo C**).

It is not necessary, nor desirable, to extend

the center support for HF band operation. The system resonates very well; a 1.2:1 VSWR was obtained as indicated on an MFJ -259B. That's not saying the system is perfect — someone with a good background in antennas could probably come up with improvements. If *you* do, let me know. However, it works good enough that it is worth giving it a try, especially if you live in a condo, or somewhere with smotheringly constrictive antenna covenant restrictions. You might want to keep a unit handy for portable/emergency operation as well, even if you have the good luck of being able to have an antenna farm! The speaker stand, extended, could double as a short mast for VHF and UHF antennas as well.

As of this writing, I understand that Valor Pro-Am antennas are no longer available. "Ain't that a shame?" (Fats Domino, 1955). Ummm, they were the easiest antenna to put up and take down as well as to add a "capacitive hat" to (maybe Ham Stick will pick up where they left off, just a thought). I suppose a fixture of some sort could be fashioned out of brass, which would hold a capacitive hat in place on the Ham Stick. I don't have the machines or machining skills to make a proper fixture.

The thought occurred to me, and it's only a thought so far: I wonder if two or more of the antenna set ups could be connected, "phased," so as to alter the radiation pattern. In past years I've seen a four-antenna setup at the Hazel Park, Michigan, Amateur Radio Club Field

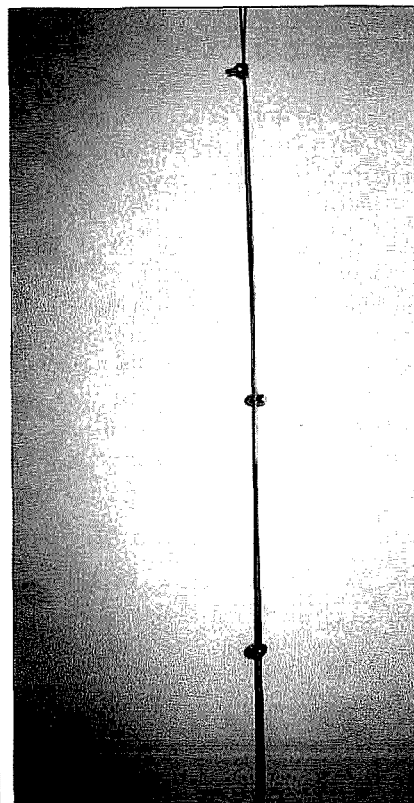


Photo D. Thimble clip placement.

Day site. There were four antennas ground-mounted, in a phased array, fed with a coaxial cable system, which was switched at the operator's position. The phasing of the antenna array was varied, which changed the directional pattern of the antenna array's radiated wave. This resulted in more energy being concentrated in a desired



Photo E. Close-up of mounting brackets.

direction during transmitting, as well as a reduction in QRM as a result of the improved antenna pattern while receiving.

In general, the mobile whip type antennas are designed to be used in the phone portion of the respective amateur bands. The problem becomes, "How do you make a stainless steel whip longer if it is too short?" The solution is simple! Another stainless steel whip! Attached to the too-short whip, with thimble clips (#4418638 1/8" Wire Rope Thimble & Clip Set by the Peerless Chain Co., Winona, MN 55987). These guys (thimble clips) look like miniature muffler clamps. See **Photo D**.

It takes a little "fumbling" to attach these clamps because they are small and hard to hold. You'll use three of them. When you get to working with them you will see what I mean. The antenna can be made to resonate at a lower frequency by using this method to lengthen the whip — long enough to resonate well below the phone portion of the band. I guess this is a physical realization of what in music is called theme and variation, in that a clamp-together whip is a variation on the theme of a pull-out whip. Thimble clips, a/k/a guy wire clamps, are used to fasten braided guy wires; you can get them at most hardware stores. A socket type screwdriver is the best tool to use for tightening the double-whip assembly. This idea works, both mechanically and electrically!

The capacitive hat idea goes back to WWII. Capacitive hats were first used on the whip antennas of PT boats, to increase signal range. Later, CBers used a version called a "Zing Ring." They found it boosted performance, so it's worth it if you can install one on the particular brand of antenna that you settle on. It does take some experimenting, of course.

The other parts used in this project are off-the-shelf items from Radio Shack, a #21-937 antenna mount bracket and #15-826 mast clamps. The mount bracket has to be drilled oval (**Photo E**) in order to accommodate the mast clamps, due to the large diameter of the speaker stand center support. I

used long shank bolts and wing nuts, in order to facilitate antenna bracket removal, without need for tools — in case I wanted to remove the whip-mount bracket, and mount a 2-meter antenna on the fully extended speaker stand. Now, how's that for an inexpensive (OK, cheap), easy-to-get-parts-for, medium-weight, sturdy, neat, fun to use, visually pleasing, professional (in an amateur sense, of course), spiffy, useful project? 73

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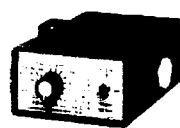
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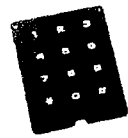
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Troubleshooting Computer Power Supplies

Rule #1: Be careful.

With the increasing availability of computer power supplies, hams are the recipients of both good and bad supplies. Because of their curiosity level and association with electronics, hams are prone to remove the cover from a power supply to see what makes it tick. Although troubleshooting a computer power supply isn't very difficult, it does present a potential danger.

Warning: Unless you have previous experience or are familiar with how to work with high-voltage/high-current circuits, do not remove the cover from a computer power supply. The internal voltages of a computer power supply reach 320 VDC with a current capacity up to one ampere. The energy generated within the circuit can be lethal — beware!

There is a tamperproof sticker on most computer power supplies warning of the danger of working inside of the box. Assuming that you understand the danger involved and have the background to work with high voltage circuits, I'll proceed to tell you what I know about switching power supplies and how to perform some troubleshooting techniques.

Theory of operation

Let me point out that there are about as many different circuit designs for computer power supplies as there are designers. Each is unique in its design, but the basic operation of each follows a single pattern, the single pattern being a high power switching circuit driving an output transformer. The

technique is reminiscent of early car radios that used a vibrator to switch the DC applied to the primary of a power transformer.

The switching circuit may use one or two power transistors, depending upon the design. Because power switchers operate pretty much like a high-powered oscillator, the output voltage requires some form of voltage regulation/control. Some designs utilize an optical coupler to provide feedback from the output circuits back to the

switchers. Other designs utilize a pulse-width-modulator (PWM) IC to sense the output circuits and control the switchers. Regardless of the method used, the output voltage is controlled to maintain a voltage level at some percentage value — typically $\pm 5\%$ of nominal.

The more you know about how a computer power supply is designed/constructed, the easier it is to troubleshoot when there is a failure. To gain familiarity with a supply, look over

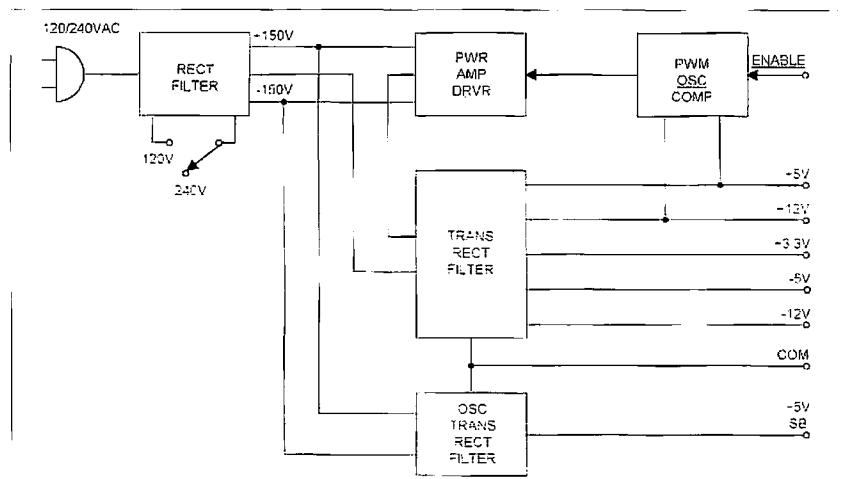


Fig. 1. Block diagram of an ATX-version computer switching power supply.



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Fig. 1, which is a block diagram of a typical ATX-version switching power supply,

You'll notice that the input voltage may be either 120 VAC or 230 VAC. A switch is placed on the side of the power supply box allowing the user to select the input voltage that will be supplied. The switch changes the rectifier from a bridge (230 VAC) to a half-wave voltage doubler (120 VAC). In either case, the total voltage that is applied to the filter capacitors ends up being close to 320 VDC. The total of 320 VDC is divided equally across each filter capacitor and switching transistor. The outer +/- voltage lines are called "voltage rails."

Also connected across the 320V rails is an oscillator/driver/rectifier circuit used for developing +5 VDC at about 0.5 A. This is called standby power (SB) and is used to keep the computer "alive" even though it is intended to be asleep during periods of nonuse.

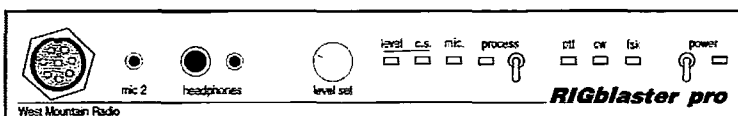
To the right of the power switching transistors is a block called the PWM. This is an IC that typically contains everything that is required to control and regulate the output voltages from the power supply during normal operation. In the case of an ATX power supply, an ENABLE line is provided to turn the PWM circuit ON or OFF as desired. Grounding the enable line will allow the PWM to come alive and drive the power switching transistors. A typical ATX power supply schematic is shown in Fig. 2.

All power supplies operating off of an AC power line require rectifiers for changing AC voltages to DC. In the case of a switching power supply, the process is done twice, with the first step rectifying the power line to produce approximately 320 VDC to

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power the power switching transistors which create AC power at a frequency in the range of 2 to 50 kHz. In the second step, the high-frequency AC power is rectified to DC at the operating voltage levels required by the using circuit, i.e., the computer.

Before getting started with problems and troubleshooting, I recommend that you spend some time comparing the block diagram to the schematic of the ATX supply. Gaining an understanding of the circuits and what they represent will allow the troubleshooting process to proceed at a more rapid pace.

Typical problems

Although I've worked with switching power supplies for many years, I've only encountered a few repeating problems (although I suspect that many more exist). Here is a listing of the problems that I've found:

- Fan

- Dried out capacitors
- Power transistors
- PWM chip
- Fuse

Fan

Of this listing, perhaps the fan has been the most prevalent failure area. Switching transistors are directly dependent upon a flow of air across a heat sink to keep them cool (typically 75–80°F). When the fan either slows down or stops and the air flow ceases to be adequate, then the power transistors tend to burn up, creating a failure.

The typical fan used in computer power supplies is of the DC brushless type with either sleeve or ball bearings. Sleeve bearings are the most common, and have the highest failure rate. After many hours of use, the oil in the bearing dissipates and the bearing begins to wear and will develop a rattle. It's possible for the fan blade to actually

hit the case, causing it to slow down. Another failure mode is for the dust accumulation to mix with the bearing oil, and create a hard muck that can stall the fan rotation.

Some fans are serviceable, but disassembling them is a little tricky because the plastic frequently cracks under tool pressure. Replacing the fan with a new one is recommended.

Capacitors

After a power supply has been in service for a long time and is typically full of dust, the air flow is somewhat restricted, causing the filter capacitors to warm up along with the power transistors. Warm to hot temperatures surrounding filter capacitors cause them to begin drying out, resulting in a loss of capacitance.

The one indicator of dried out capacitors is an intermittent start-up of the power supply. This is particularly

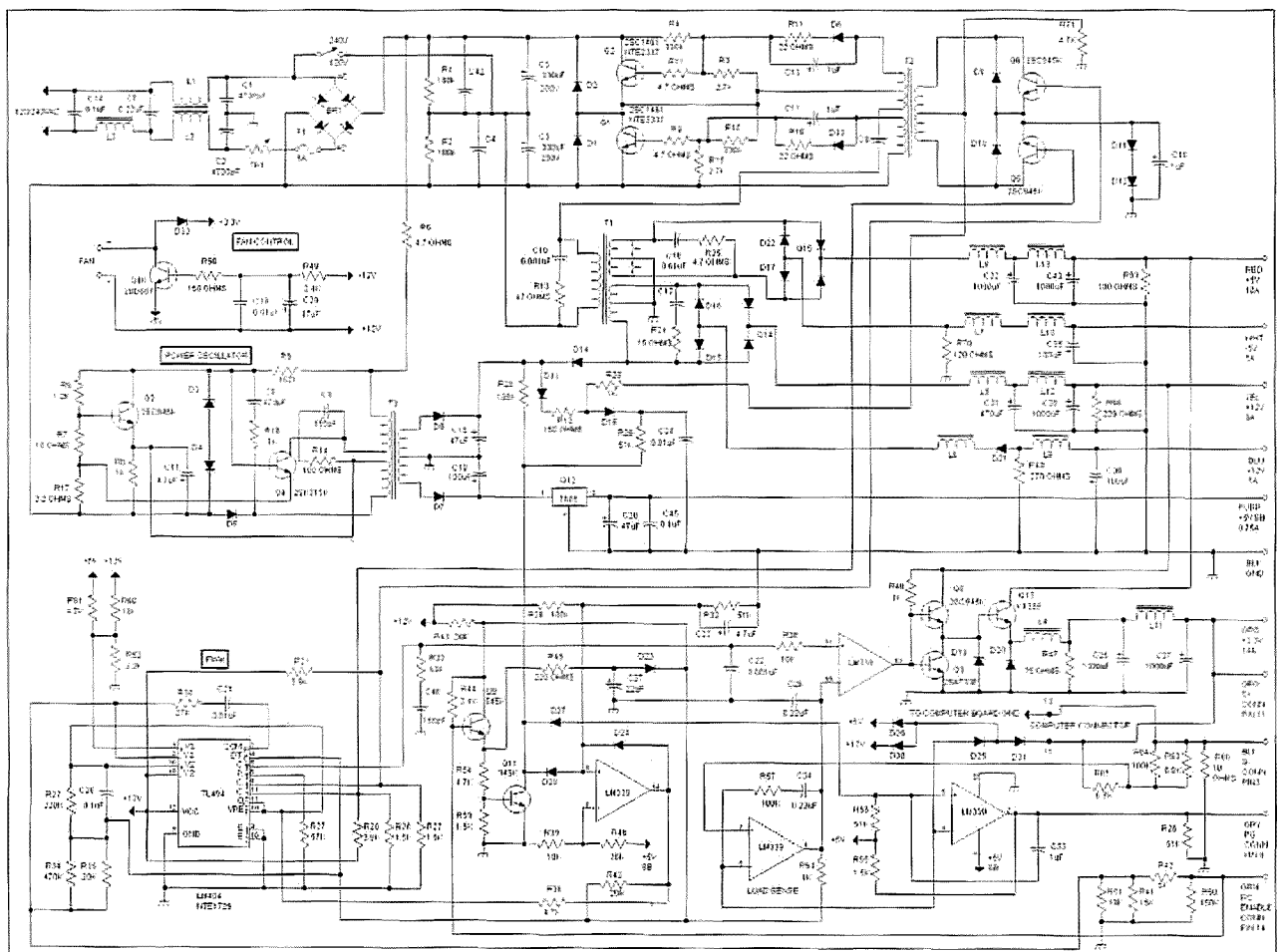


Fig. 2. Schematic of an ATX-version computer switching power supply.

true for the model series of supplies that use a voltage boost circuit to power the PWM IC. The voltage is boosted from about 12V to 21V to power the PWM IC and the small output driver transistors. If the boost filter capacitor is dried out, the voltage is never boosted and the power supply is very reluctant to "come up" when enabled.

Normal troubleshooting techniques will fail to identify a specific problem with the circuit, yet it fails to operate. When I've encountered such a problem, I go immediately to the boost filter capacitor and change it, which usually results in a more normal operation. As a rule, if one capacitor is dried out, others are most likely dried out as well. Changing all of the capacitors may be a good idea, but probably not a very practical solution.

Transistors

Power switching transistors rarely fail in normal power supply operation. Therefore, when a transistor fails, it is usually caused by a lack of cooling air or a shorted DC output circuit.

Fuse

A fuse failure is somewhat obvious when the internal fuse link (element) has been vaporized. When that condition is observed, then you might conclude that something drastic created the actual failure and some extensive diagnosis may be required.

On the other hand, fuses also have their own failure mode, which isn't quite as obvious as a melted element. A fuse is typically made by attaching a fusible link between two metal end caps, and because the element is a resistor it will get warm during use. Heating and cooling of the element causes a mechanical stress on the element that will cause it to break. The break occurs more often than not near a cap rather than out in the middle, where the break might be observed through the glass tube.

Others

Rectifiers and filter capacitors can also fail, though rarely, but when they

do fail, they place an excessive load on the switching transistors and cause them to fail. When a power transistor fails, look for additional problems that might have caused the failure.

Up to this point, we've considered the safety issues involved and have gained some insight into the basic design of a computer switching power supply with a focus on effecting a repair. Some typical problems have been identified, along with a brief discussion of typical failure modes.

Safety tips

Personal safety is of the highest importance when working with any dangerous piece of equipment, and that includes computer power supplies. When working with an open computer power supply, it is imperative to work with only the low voltage side of the power supply when AC power is applied. There are times when some measurements must be made on the high voltage side of the supply, but when that's necessary, connections to the HV side must be done when the AC power is removed from the supply.

A meter may be attached to the HV circuit and then read after the power is applied.

To work on the underside of the power supply board, the board must be lifted and turned upside down without having to remove the wires connected to the power connectors and switch. Either a cardboard

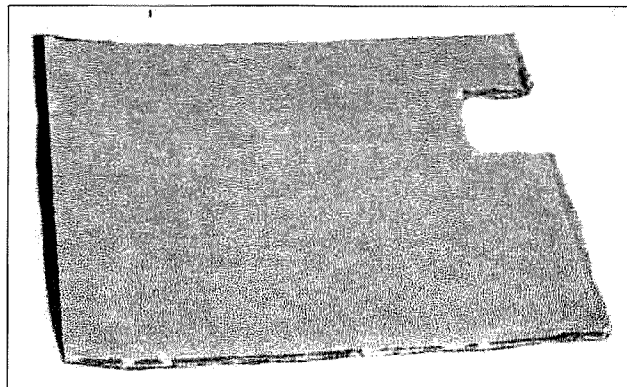


Photo A. Heavy cardboard used as a support during troubleshooting.

the board and the case to provide a fairly stable mount for the inverted board. **Photo A** shows a heavy cardboard sheet that I use as a support and insulator. **Photo B** shows the power supply board inverted on its case, exposing the circuitry for diagnosis.

While inverted, short solid jumper wires may be tack soldered to stand up on various pads where measurements are to be made. Meter leads can be clipped to the jumper wires so that hands may be kept away from the circuit when power is applied. Power is removed after making a measurement and before the meter leads are touched.

For safety's sake, it is important to not touch any live circuit or the HV side of the circuit board. How do you tell the LV section from the HV section? It takes a little practice, but the bottom side of the circuit board is

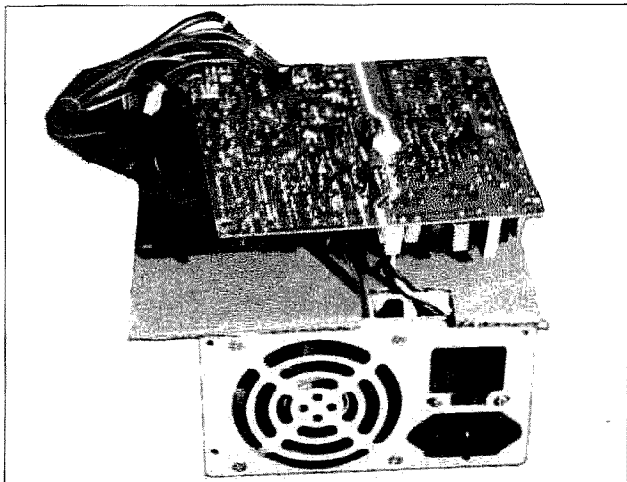


Photo B. Power supply board inverted on the cardboard and ready for diagnosis.

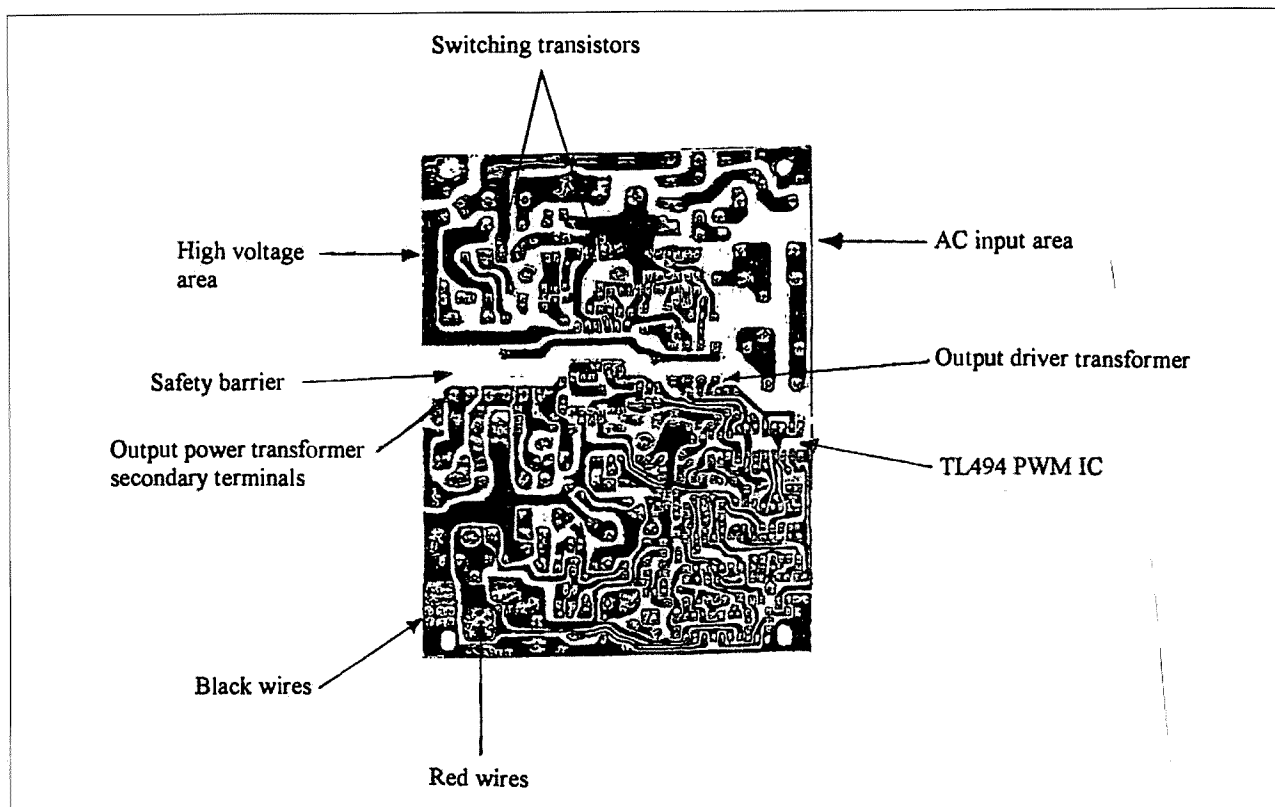


Fig. 3. Bottom side of a typical switching power supply board. Specific items are noted for identification.

divided to provide isolation between the HV and LV sections. It really pays to just study the bottom side of the board and identify as much as you can about it before ever applying power. Fig. 3 shows the bottom side of a typical switching power supply. Specific identification points are shown that will both support safety as well as assist the troubleshooting process.

The first and most prominent indication of which section is which: Look for the switching transistors, as they are always on the HV side of the

supply. In addition, the HV filter capacitors are also on the HV side. Another indicator of the LV section is the location where the heavy black, red, yellow, etc., wires are connected.

Remember, it is for your safety that you become as familiar as possible with the board layout and circuit voltages before beginning a troubleshooting process. Dangerous voltages are present on the power supply board, and care must be taken when the board is openly exposed while AC power is applied. Caution must be exercised at all times.

Troubleshooting

Troubleshooting the circuit board starts by an attempt to identify and classify the problem symptoms that exist. In most cases, when a computer power supply fails, it is "dead" and fails to operate. That particular clue is generally not sufficient to lead you to a defective component. Because a switching power supply operates pretty much as a closed loop system, all pieces of the system must be operational before the power supply will come up and operate. Therefore, it's sometimes very frustrating to sort out what is really causing the failure. The most logical troubleshooting process is to check as much of the various parts of the circuit as possible and "clear" them of any fault. By a process of elimination, the fault will eventually surface.

Before applying power to the supply, gather all of the test gear and resistive loads that are desired. I've found the following items to be needed:

- One or two voltmeters (analog or battery-powered instruments only)

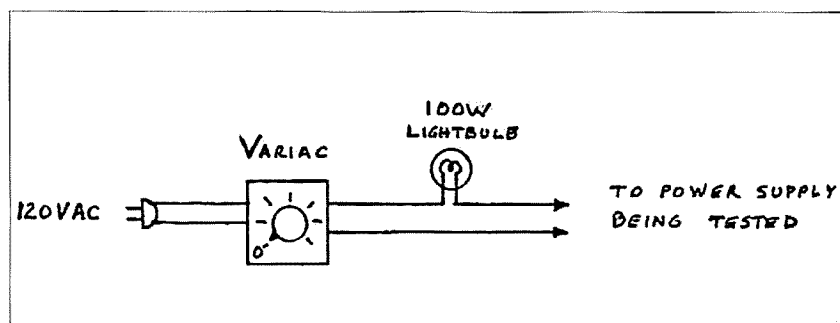


Fig. 4. The use of a Variac and series-connected light bulb for controlling line voltage and current while a power supply is undergoing diagnosis. The light bulb provides a visual indication of the amount of current being drawn.

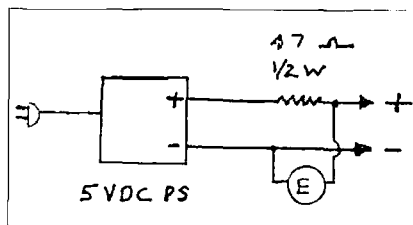


Fig. 5. A 5 VDC power supply, or a 3-6V battery, used for testing shorted components in the output circuits of a computer power supply.

- An oscilloscope
- 5 VDC power supply (or a 3-6V battery)
- 5 ohm 10 W resistor
- 10 ohm 20 W resistor
- 47 ohm 1/2 W resistor
- Selection of clip leads
- Variac
- 120V/100W light bulb in a socket with a line cord attached

Notes

1. As a caution, oscilloscope use

must be restricted to only the LV side of the supply.

2. The 100 W light bulb is placed in series between the Variac and the computer power supply (see Fig. 4).

3. The 5V power supply is used to test all of the low voltage output circuits for shorts. A 47 ohm resistor is connected in series with the output of the 5V supply and acts as a current limiter (see Fig. 4).

4. In the case of an ATX-type supply, the enable line must be switched to ground for the supply to be "turned on."

5. Remember that if the board fault is found and fixed while the board is inverted, there will be no heat sink cooling from the fan. Excessive testing must be avoided to prevent overheating of the switching transistors and rectifiers.

Test steps

CAUTION: Be sure to observe voltage polarity for all components and measurements.

DO NOT RELY ONLY ON THE POWER SWITCH TO REMOVE AC POWER; PULL THE PLUG BEFORE ATTEMPTING TO TOUCH OR WORK ON THE CIRCUIT. ALLOW A FEW MINUTES FOR THE HV FILTER CAPACITORS TO DISCHARGE — CHECK THEM WITH A VOLT-METER.

A. Clear all DC output circuits of any shorts. This process involves connecting an external 5 VDC power source through a 47 ohm resistor to each of the 5V

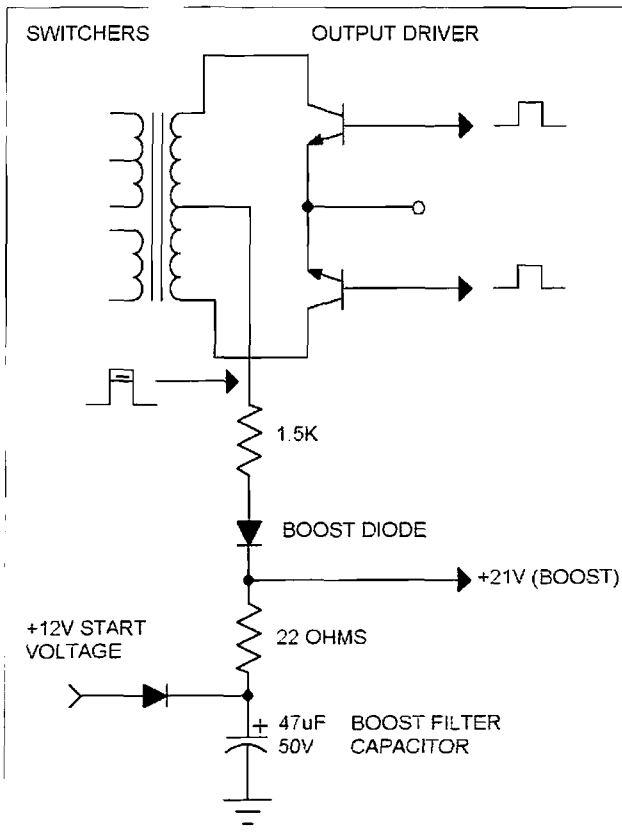


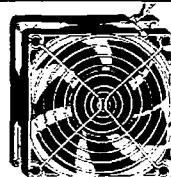
Fig. 6. Typical voltage boost circuit used in some computer power supplies. The transformer flyback pulse is rectified and filtered to create a voltage output higher than the 12V source (boost voltage).

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To check the 3.3V output: With 5V applied to the main 5V output, measure the voltage on the 3.3V output. The 3.3V output is sourced through a regulator or pass transistor from the 5V output. If necessary, remove the 47 ohm resistor from the 5V power supply in order for the 3.3V circuit to operate normally. Note: The 3.3V output is sourced from the main 5V output, but the 3.3V driver/controller may be sourced from the 12V output. Therefore, little or no 3.3V may be present during this portion of the test.

Problem: Occasionally one of the small components will fail, shutting down the supply. It is usually necessary to lift one end of one or more of

Again, the dangers involved must be emphasized and that you must exercise caution when working around high voltage circuits. Test equipment such as voltmeters must be connected to the HV circuit prior to having power

applied, and then removed after the AC power has been turned off. Any AC-powered test equipment such as an oscilloscope must not be connected to the HV circuit at any time, as there is insufficient voltage isolation to protect either the operator or the equipment. Use of the oscilloscope must be restricted to only the low-voltage side of the circuit.

As a reminder, should the switching transistors be made operational during the power test phase, insufficient cooling air will be present to protect the transistors. Power-on test periods must be kept short.

Now, continuing with the test steps:

D. Setup steps in preparation for applying AC power.

Assuming that the fuse checks "good," then steps may be taken to apply AC power following these suggested steps:

1. Connect the 5 ohm resistor to the main 5V output (red) and ground.
2. Connect the 10 ohm resistor to the main 12V output (yellow) and ground.
3. Connect a voltmeter (set on the 500-600V range) to the 320V rails.
4. Using the Variac, raise the AC line voltage and observe the voltage developed across the rails. The value measured, with the switch set for 120V, should be approximately 2.8 times the AC RMS applied voltage.
5. If the light bulb glows dimly as the Variac supplied voltage is raised, then slowly increase the line voltage to 120V. Take note of the "320V" reading.

Problem: If the voltage fails to track at approximately 2.8 times the RMS source voltage, then remove power and troubleshoot the HV rectifiers and filter capacitors. It may be necessary to temporarily remove the switching transistors should they be suspected of being shorted.

Note: To remove the switching transistors, remove the whole assembly by unsoldering the transistor leads, and then remove the heatsink retainer screws. Carefully lift the assembly, making sure that the transistor leads lift out of the board.

reasonably close to the 320V, then connect the voltmeter across each of the HV filter capacitors as the AC input voltage is raised.

Problem: If the two measured capacitor voltages are drastically different, consider that one of the power transistors or one of the capacitors may be shorted. Temporarily remove the power transistors and repeat step 6 to verify an equal voltage across each capacitor. If the voltages still fail to be close (equal) in value, check the capacitors with an ohmmeter. If the capacitors are OK, then consider the HV rectifier or the 120/230V switch as a possible problem.

E. The voltage boost circuit is always a potential problem when it is used in the power supply. Refer to the partial schematic of the boost circuit as shown in Fig. 6.

Note: Not all switching power supplies use a boost circuit.

One technique that has worked for me is to tack solder a 47 μ F/50V capacitor between pin 12 and ground of the TL494 PWM IC.

Problem: If the power supply comes up into operation reliably with an external capacitor in place, trace the TL494 pin 12 circuit back to a filter capacitor. The boost filter capacitor should be of a value similar to 47 μ F. After changing the boost filter capacitor, be sure to remove the tacked-in 47 μ F test capacitor.

F. Output filter capacitors do fail by drying out over time. The failure mode is typically a loss of capacitance, causing the output ripple to increase.

Test method: A capacitor of 100 μ F or greater having a voltage in excess of the circuit being tested may be tacked-soldered across the suspected capacitor. If the power supply operates, then replace the suspected capacitor.

Another test method is to connect the scope across the circuit in question and observe the ripple value. **Note:** There must be a resistive load on the output of the circuit being tested.

Observe any significant change in the ripple when a like capacitance value is added to the circuit. **Note:** Be

6. If the 320 volts fails to measure

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Troubleshooting Computer Power Supplies

continued from page 21

sure to remove power before adding or removing a filter capacitor.

G. Having cleared all output circuits, the voltage boost circuit, and the power supply still fails to operate; it may be time to use an oscilloscope to check the PWM waveforms. A complete schematic of a voltage boosted power supply circuit is shown in **Fig. 7**.

Attach the oscilloscope probes only to the low-voltage side of the supply. The scope is sometimes useful for looking at the signal output from the TL494 IC. Pins 8 and 11 are the oscillator output pins and they provide a pulsed waveform that is used to drive the bases of the output driver transistors. The scope ground is attached to the black DC (ground) output lead and the probe tip is connected first to pin 8 and then to pin 11 of the TL494.

Problem: The waveform obtained from both pins 8 and 11 should be very similar in shape and amplitude. The peak amplitude of the pulse will be limited to a value approaching 2.1V. If

the waveform is missing, verify that DC voltage is applied to the PWM IC. If the DC voltage is there, consider substituting another TL494 before repeating the tests. It's also possible that the RC timing circuit connected to pins 5 and 6 of the TL494 is defective.

H. Measure the DC voltage from the driver transistor emitters to ground. Typically, two diodes are connected in series conducting from the transistor emitters to ground. The DC voltage drop across those two diodes must be in the range 1.2–1.8V when the transistors are being properly driven by the PWM.

Problem: If the voltage across the diodes is low, the driver transistors are not being turned on. Use the scope to observe the driving pulse found on the base of the driver transistors. Check twice before connecting the scope probe.

I. Assuming that TL494 pins 8 and 11 are exhibiting equal pulses, then place the scope probe onto the center tap at the driver transformer (collector/primary side). If the power supply utilizes a DC boost voltage, a series of vertical rising pulses should be observed at the center tap with an amplitude approaching 15–20V.

Problem: If the center tap voltage pulse is present, then the boost voltage should be available at approximately 20V. When the boost voltage fails to rise from 12V to 20V at startup, check the following components: boost diode, boost filter capacitor, and resistors.

Another place to check is the input to one PWM voltage comparator. One voltage comparator is used to monitor the boost voltage. Check all of the components associated with the boost sensor circuit.

Replacement parts

At this point almost all of the obvious failure mechanisms have been checked within the power supply and hopefully the problem has been detected and perhaps corrected. Repairing a power supply requires, in most cases, a part to replace the bad one,

and there is always a quandary as to where replacement parts can be located.

One of the biggest dilemmas facing a ham these days is in locating suitable parts for projects. Because much of our electronic equipment is now built offshore, replacement parts are not readily available. One of the techniques that I use to get around the shortage is to salvage TV and VCR boards as they are scrapped.

Parts such as capacitors and resistors can always be used in ham projects so they are of great importance to me. Semiconductors from TV and VCR boards are of a lower priority unless I know the part and have a place to store it.

When it comes to parts for computer power supplies, a source for available parts is certainly lacking. NTE replacement semiconductors are perhaps the most readily available, but many types are not covered by the service. To counter the problem, I've started collecting used computer power supplies and "rob" parts from one or two as the need arises in order to repair another.

Occasionally power supply HV filter capacitors appear in the new and surplus parts catalogs so you need to keep a sharp eye peeled for the items needed.

Conclusion


Repairing a computer power supply is quite a satisfying experience for a ham. It's also a new exposure to HV techniques and safety practices beyond what you might experience in typical solid-state circuits. Personal safety is an important issue when working with computer power supplies and caution is not to be avoided for expediency.

Hams get involved in a lot of electronic projects, and it is expected that an attempt at repairing a computer power supply will occur. The suggestions provided here on troubleshooting computer power supplies should allow a ham to be successful in the process.

Although the troubleshooting process and finding a "bad" part is fairly easy, safety is the word. Please be careful!

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Build This Simple SMT Station

Dinner and a movie? How about pizza and a project?

SMT parts are rapidly becoming the "norm" in consumer electronics manufacturing. This "home-brew" device can make the learning and building process with SMT devices a more pleasurable event.

My initial entry into the hobby was during the generation of tube-type gear (and yes, I'm older than many and younger than a few). I then went to solid state and now have progressed to SMT (surface mount technology) devices. Not wanting to be "left behind," I've been thinking of trying a project using SMT.

SMT, as it's called, is becoming more and more the standard of the industry. That's not to say that all parts are being replaced by these miniature devices, but it sure seems to me that there are many more projects designed around them now than in the past. The manufacturers of consumer electronics can produce these parts more economically than "through-hole" items. Then there's the placement of parts on an assembly line, where robotics can handle the task effectively using the newer devices. Lately, most of the consumer products I've obtained were constructed using this technology. The "writing is on the wall," or should I say, the "chips are on the board."

That's what progress is. I suppose: adjusting your skills to coincide with technology. In April, at Atlanticon 2002, W2GUM sported an impressive SMT work station as an entry in the

home-brew event. His design is a square, padded work surface, with a machined-brass weighted and adjustable arm, and a padded "turntable" at the business end where construction could take place. Very neatly done and a testament to his skill as a machinist.

I was very impressed by the design and construction of his work station, but keenly aware that not all of us are machinists, capable of duplicating that device — least of all, me! I am fairly

comfortable working with common hand tools and a few "home owner" power tools, and I suspect that many of you are also. So why not make your own station, using easier to obtain materials, while using the tools that most of us either have or can borrow?!

The initial thoughts for design were centered on using a "pizza pan" as the base for the project. This proved to be a poor choice, because the structure of the pan was of such thin sheet metal

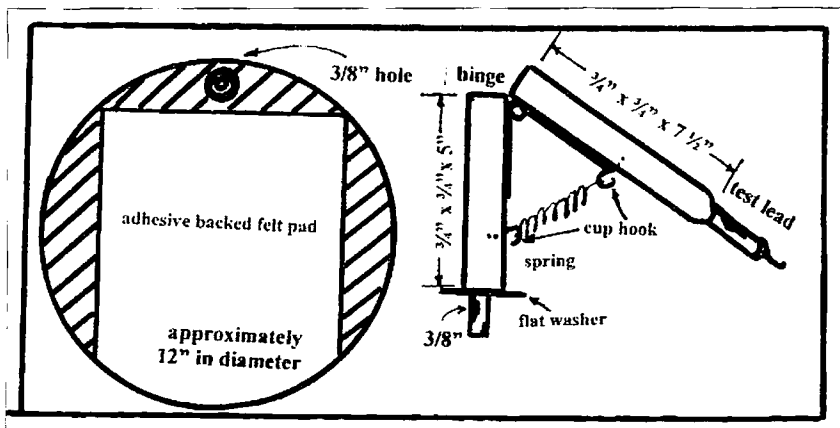


Fig. 1. Dimensions of the base and hold-down device are approximate. They were selected to use the wood "stock" I had on hand to match the "hobby hinge," and the base size is the remaining "stiffener" for the pizza pan. The primary requirement is, however, to have the test lead point become usable in the lower half of the working surface.

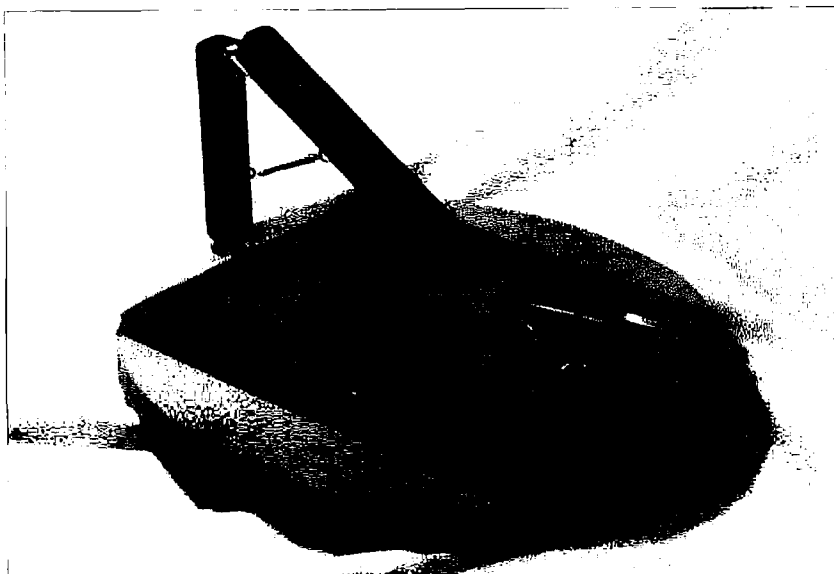


Photo A. The completed SMT work station, ready for operation. Not high-tech or difficult to build, it does make assembling a surface mount project much easier to do.

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that flexing of the pan caused by the tension-producing arm would pose a problem.

Using the pan as a template, I cut the same-size disc from a composite wood material, expecting to use it as a "stiffener" under the pan. I then realized that the surface treatment on the pan was a "no-stick" material, and had the work station been completed, the circuit board would likely be sliding around uncontrollably! I wish I had realized that *before* I bought the pan! So the pan joins the pile of "good thought, bad idea" stuff.

The wooden stiffener, as a base, has proven to be the best answer. The attached drawing, (Fig. 1), gives measurements I used to create my work station. The measurements aren't critical; they "fit" my device. Your overall dimensions can be modified to fit your parts. Keep in mind, though, that the pressure point (i.e., the part that holds the SMT to the board) should fall approximately in the lower third of the work surface. I had a test lead probe in my junk box just longing to become part of a project. A "push point" ballpoint pen housing. I suppose, would have worked equally well, provided of course that the pen part was eliminated and a finishing nail of suitable size was epoxied into the housing in its place.

I filed the end of the nail to rest flat on the part being placed, having found that the point originally there marred the surface of the part. Spring tension is a matter of "guess and stretch." Don't make it so tight that the part either breaks or can't be moved. Just enough tension to hold it down firmly but allow it to still be movable. The arm assembly sizes were chosen to fit the hobby hinge (3/4" wide) and the 3/8" test point I had. You might have to adjust dimensions to fit your materials. The flat washer epoxied to the base of the shortest "arm" aids in stability by providing a larger flat surface for the arm to move on.

The felt surface applied to the wooden base serves two functions. First, it holds the project circuit board to protect it and stops it from sliding, and secondly it provides a convenient contrasting color apart from the parts being installed. Black or white parts are more visible on the green surface and therefore easier to keep track of. (See Photo A.)

And there you have it! An SMT work station that cost almost nothing to assemble. Construction time varies with the user's abilities and can be modified to fit your needs or available parts. It's small enough to be stored in a desk drawer when not being used, but somehow I suspect that it won't see the insides of the drawer for some time to come.

Now, when the gang shows up, I can offer them pizza. After all, I do have one very new, very unused pizza pan from the beginning of this project. **73**

12-inch diam. wooden base
8-1/2-in. by 11-in. self-adhesive felt pad
Feet, 4 each
Cup hooks
Hobby hinge (hasp and staple assembly available at Home Depot)
Test point or ballpoint pen casing
Finishing nail
Epoxy or glue
Spring
Flat washer

Table 1. Parts list.

How's That Thing Really Work, Anyway?

Part 1: Receivers.

At a recently attended club meeting, a newly licensed operator confided in me; "Yes, I passed the test, but I haven't any idea how any of this stuff works! I just memorized enough to get through the test and get my license." Sound familiar to any of you out there?

The neophyte radio amateur has spent hours studying the license manual, practicing the exams, to finally complete the process and gain his or her "ticket" to proudly display on the wall. This is great! One more member enters the hobby.

But there's a problem here! Many (and some longer-licensed hams) haven't a clue as to how their gear performs the functions that it does. This article isn't intended to replace the countless tomes available that teach the engineering functions from the "ground up." It's merely an overview of the basic sections of a piece of equipment, how they interact with each other to produce the desired result after turning on the switch. Knowledge is gained one segment at a time. I hope this segment encourages you to further your knowledge in electronics. If not, you should at least have a basic understanding of how a receiver "works."

I chose to begin with receivers. No particular reason, it was the first piece of gear that came to mind. When telling you about a circuit or function, I will try to stay away from the engineering facts that all equipment are built from, and attempt to explain the

subject without a lot of technical jargon. My goal is to have you be able to *visualize* the happenings within your equipment sections, not to design the circuits. You can add all this knowledge to your "storage bank" later as you gain experience in the hobby. For now, just understanding the basic ideas of how a system works is OK.

Let's begin with a very basic BLOCK DIAGRAM of a receiver. Block diagrams are great because they represent circuits and paths for signal flow. The actual circuit components, their values and how they are connected are described in a SCHEMATIC. We won't deal with schematics here. Block diagrams show direction or the logical path we must follow to achieve results and present an "easy to understand" overview of the device being described. This process will become clear to you as we progress.

An example will help you understand how the receiver works. Let's suppose that we would like to listen to the 80-meter band, say from 3.500 MHz to 4.00 MHz. While exploring the lower end of the band, we hear AB2AF, Arthur, sending CW on 3550 MHz. We know what frequency his

transmitter is on because the frequency is marked on the front panel of our receiver or the digital readout indicates that frequency. But how does a signal being generated far above the audio spectrum become transformed to the range usable by our human hearing?

The starting point of a receiver is the RF INPUT circuit that is connected to the antenna. It is composed of circuits "tuned" to the desired frequency we wish to receive. By "tuned" we mean that the signals passing through a coil and capacitor network are only those between 3.5 and 4.0 MHz. There are often two or three sets of coils and capacitors "ganged" or joined together to provide the "bandpass" desired. This is accomplished by having the values of each coil/capacitor pair slightly different from each other. Other frequencies are blocked or "tuned out," and aren't allowed to pass through the network. The receive antenna is connected to the input side; the away side is attached to the MIXER stage.

Having a tuned input is a good thing. While antennas are designed to receive selected frequencies, they also receive a wide range of other frequencies. These additional frequencies if allowed to pass would have a negative effect on

the operation of the receiver. Thus far, the signal we desire to hear has been intercepted by the antenna and passed through a tuned circuit called the RF INPUT circuit which has been designed to pass only those frequencies between 3.5 MHz and 4.0 MHz, and is shown in Block A of Fig. 1.

The output of the RF INPUT circuit is attached to a MIXER stage, labeled Block B. Mixers are commonly identified on a block diagram by the circle with an "X" through it. The MIXER has two signals feeding it, the frequency we desire to listen to with its variations in frequency from being keyed at the transmitter, and the output from a VARIABLE FREQUENCY OSCILLATOR (Block C). The variations of the transmitted signal mathematically combine with the VFO signal. It is the mixer's function to combine these two frequencies and provide a single usable frequency as an output.

Mixers are just what the name implies. They combine frequencies to provide an output. There are four desired output possibilities from a mixer, either of the two originals, or the sum or difference of the two. For our receiver, we will use an INTERMEDIATE FREQUENCY (IF) of 10 MHz. This frequency is commonly used in QRP gear, and will be explained as we progress through the receiver's circuits.

So our signal is being received on 3.550 MHz through the RF FILTER and has arrived at the MIXER input. The MIXER must provide a 10 MHz

output to be compatible with the remainder of the receiver. Because the mixer has two input frequencies and one of them is 3.550 MHz, the second frequency to be supplied by the VFO in our example will be 6.450 MHz. This will enable the mixer to provide a 10 MHz output.

The VFO or VARIABLE FREQUENCY OSCILLATOR is a circuit designed to provide a signal to the mixer that is stable, accurate, yet variable in frequency. The range of the VFO is carefully selected to enable the mixer to use the frequency to provide an output that will be compatible with the remainder of the receiver's circuits. For this example, the range of this VFO, to be compatible with this circuit, will be from 6.000 MHz to 6.500 MHz. Using this range of frequencies from the VFO uses the "summing" principle to achieve the required 10 MHz output. By "adding" the incoming signal frequency to that of the VFO, the 10 MHz output frequency is realized. You could also use the "difference" principle, where the VFO would be designed to operate from 13.500 to 14.000 MHz. This would also result in the 10 MHz output needed. Lower-frequency VFOs are generally easier to design and operate and are therefore more commonly used.

Suppose another signal is present on 3.510 MHz, 10 MHz from the low end of the band. You would "tune" the VFO "down" 10 MHz to 6.490 MHz. The mixer circuit would combine the

incoming signal on 3.510 MHz with the VFO signal on 6.490 MHz and provide an output on 10.0 MHz. The output of this receiver's mixer will always be 10 MHz and have a bandwidth of a few kilohertz above and below the 10 MHz frequency.

The next blocks are the IF FILTER and AMPLIFIER, labeled D and E. D contains a bandpass filter designed to allow only the 10 MHz signal provided from the mixer to pass and E is an amplifier to "boost" the signal strength. Often the IF FILTER is composed of a *crystal lattice network*. This is a series of crystals (in our case 10 MHz) and capacitors designed to allow only the 10 MHz signal to pass. The crystal frequency identifies the "center frequency" of the filter, while the capacitors are selected to provide adequate bandwidth of the filter. CW filters are designed to be narrow, in the range of 750 Hz to 1,000 Hz, and SSB filters are in the 2 to 3 kHz range. While the crystals "set" the frequency allowed to pass, the filter will allow frequency slightly above and below the 10 MHz crystal frequency to pass also. These variations are Art's CW signal being passed along through the circuits.

Our signal has now passed through the IF FILTER and AMPLIFIER and is present at the input of the PRODUCT DETECTOR circuit (F). It has a different name, but it functions just like the MIXER described earlier. It has two inputs and can provide one of four outputs just like the mixer circuit. The big difference here is that the PRODUCT DETECTOR is used to mix frequency from the BEAT FREQUENCY OSCILLATOR (G) or BFO to provide a low-level audio output. The beat frequency oscillator works just like the VFO, but provides an output on only one frequency.

Now how does that happen, do you suppose?

The BFO circuit in our example contains an oscillator circuit using a crystal identical to those in the crystal lattice filter (10 MHz). This oscillator

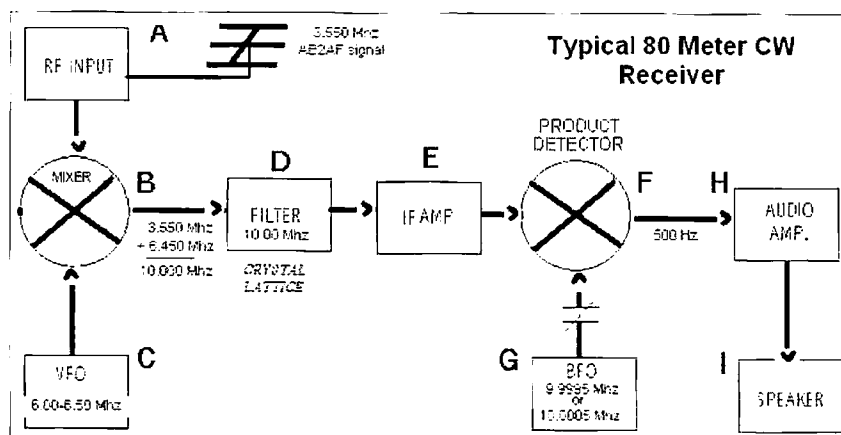


Fig. 1. Typical receiver block diagram, showing input bandwidth and signal, VFO and BFO frequencies, and audio output.

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Warblemania

... and other QRP afflictions.

You can't follow the work of the New Jersey QRP Club or Dave Benson K1SWL of Small Wonder Labs without seeing references to our leading edge digital mode, PSK-31, and a kit called the "PSK-80 Warbler."

The Warbler QRP transceiver is priced right (\$45) and seemed like a nice change of pace from CW kits. When mine arrived I put on some music, warmed up the soldering iron, and started jamming in parts. The transformers slowed me down a bit. These are multifilar (have more than one winding) and have to be wound exactly according to the plans.

In some of Dave's other kits he provides a nice magnet-wire ribbon cable that keeps the windings from getting fouled up. In this case you can wind one wire at a time. Each wire has to appear at the correct side of the core after each turn, and the wires should not cross inside the cores. It's hard on a black and white diagram sheet to keep track of three colors (my wife has this issue with quilt patterns) — I ended up deciding the "white" wire on the diagram was for the red wire. I just noticed there is a nice color picture of an assembled Warbler on Dave's Web site that would have been most helpful.

I breezed by the two surface mount SA612A ICs. To do these, pre-tin a pad at each corner of the mounting pad for the device. Then take a pointed tool, slide the part in place (watch the dot for pin one), and warm up the corner

pads one at a time to tack them down. If you have the part centered, you can then warm up the remaining pads and put a little solder on each. I ran into Dave Benson and asked him about this — he says he warms up an entire side of the IC pads, and blobs in solder. Then he uses desoldering braid to remove the excess. I shared with him my theory on the need to open a cold malted beverage to calm the nerves while working with surface mount parts. He said that this has some

scientific merit — it lowers the brain synapse-firing rate, so you would be less jittery while soldering.

Haste and overconfidence are not the friends of kit builders, as the little rig didn't work. I only caught myself making one assembly mistake on the 30-part board. I spent maybe an hour poking around and worrying whether I had done a good job on the transformers, or gotten a short someplace.

The cabling to the laptop was an absolute nightmare. Part of the problem

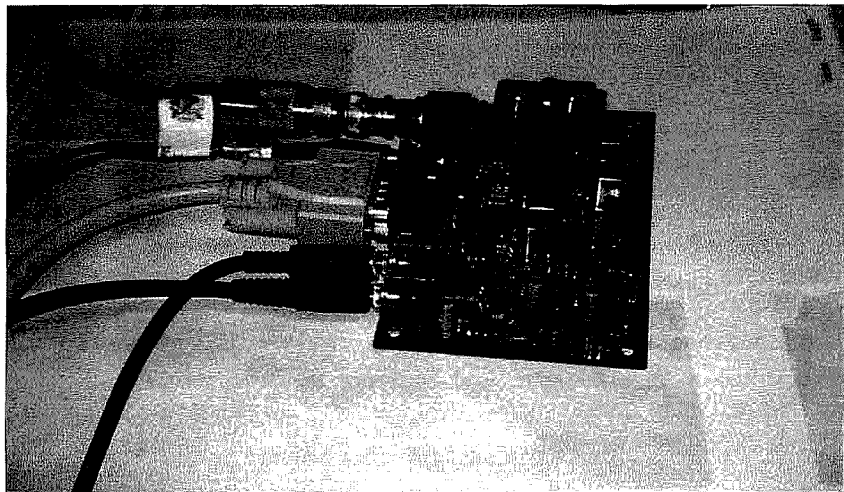


Photo A. PSK-80 Warbler.

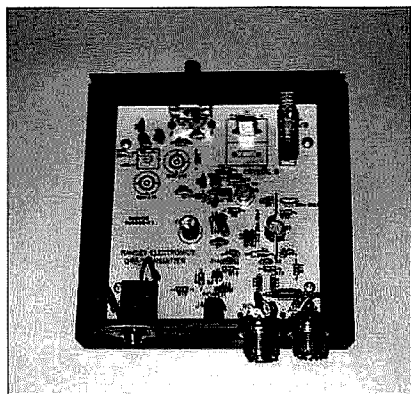


Photo B. Ramsey QRP-20 Transmitter.

is left over from the audio equipment days — “output” is relative — one box’s input is another box’s output. If you decide on “line” vs. “microphone,” that is a start. There is also tendency for the audio from amateur rigs to be mono, and for the sound cards on laptops to be stereo. I ended up making two trips to Radio Shack for 1/8" jumper cables, and stereo-to-mono adapters. My final setup from the Warbler to my vintage TI laptop was as follows:

From J1 “AF Out” on the Warbler board — a mono 1/8" male-to-male jumper with a mono jack-to-stereo plug adapter on the laptop microphone end.

From J2 “AF In” — a stereo 1/8" male-to-male jumper to the laptop headphone jack.

After deciding I was getting too little AF input and too much RF output, I finally noticed that I had a pair of resistors reversed. This means I made three

wiring errors out of thirty parts — 10:1 — which is my usual ratio. There is a minor error on the 10/29/00 board layout diagram on my version of the kit. R4 (100 ohms) was not labeled. And L1 should say 68 μ H instead of 10 μ H. My wiring mistake was in swapping a 2200 ohm and a 22k resistor.

I tuned up my G5RV antenna in the tree outside and fired up the Digipan software. The software distribution site had moved since the original *QST* Warbler article, but Dave’s site had a corrected link. I found one of the railroad track patterns on the screen and clicked the mouse on it. The station I called, K2EZR, wrote back that I needed to reduce audio gain to the Warbler as I was splattering. This led to having to find the correct sound card drivers for my laptop that placed the volume control icon on the Windows® task bar. I may need to build an outboard hardware volume control to get the right level of precision, and allow the control to be set the same each time the computer is rebooted.

Ramsey QRP-20 20m transmitter

One of my favorite receivers is the first one I ever built from scratch, a basic 20-meter model from W1FB’s *QRP Notebook*, Fig. 3-23. I made several attempts at a scratch-built 20m companion transmitter, with no luck at all.

I was wandering the back corners at the Midwinter Madness Hamfest here, and saw one of the vendors with a display of Ramsey kits. For \$29.95 there

was a 20m transmitter kit with crystal, and they had a matching case available. I thought the kit was priced only a little bit more than the cost of the crystal alone.

If you are not in the mood to wind toroids, this kit is perfect — there are none. After a pleasant few minutes this one was together and working. I did take the time to change the RF connectors from the RCA-type phone jacks to PL-259 jacks on the back of the case. This kit has a built in transmit/receive switch which can save adding an external model, and has room for a second crystal.

Small Wonder Labs’ 20m PSK-31 transceiver

At the recent St. Cloud, MN, hamfest, George NØVPR had what looked like a Warbler for sale. I asked him about it — he said it was actually a 20m version. I asked why he was selling it — he said he could not get it working, and did not have enough fancy test equipment to check it out.

I said right away if he was anything like me he had a wiring mistake or two and that was it. He gave me a look of, “Well, I don’t think so, but anything is possible.” I said I’d take it home and fix it up. Back on the bench, I checked every part. No mistakes at all — the coils and soldering looked excellent, nice and neat. I took out the cables and battered laptop from my Field Day/emergency bag where my Warbler was stored and fired it up. Right away there were tracks and signals — this time from far away, like Florida and California. I sent a relieved George back his Warbler and a copy of my laptop-to-Warbler wiring instructions.

QRPCI-FDIM

This imposing set of acronyms is really the “Four Days in May” QRP event. It’s every year in Dayton during the Hamvention at the Ramada Inn South, near Dayton Mall. They rent out much of the hotel and hold a full-scale QRP convention. There were over 200 folks there this year, and I had a chance to meet many of the leading lights of QRP. The Rev. George Dobbs G3RJV had a witty

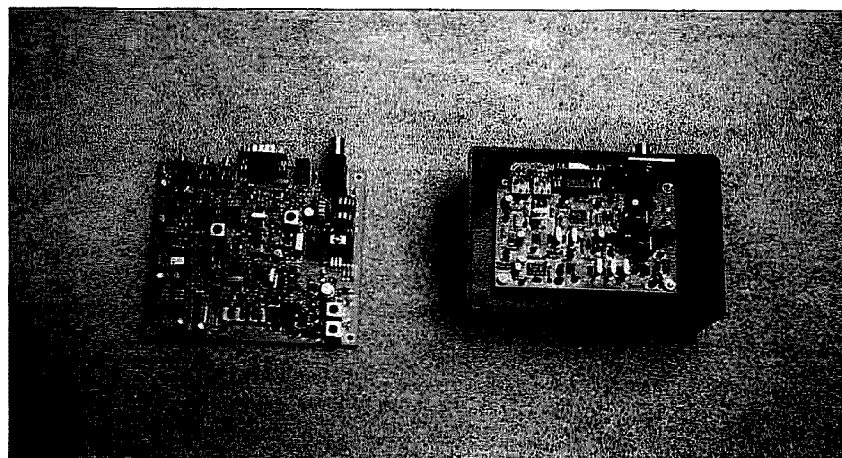


Photo C. Left: 20m Warbler; right: in box, 80m Warbler.

presentation. He is a very good speaker (years of practice on Sundays, I think) and was warning us of the danger of "pelf" — goods acquired with money one does not earn, to impress people one does not care about. I pondered this while loading up my pull cart at the big flea market, and concluded that if I spent my lunch money on something I alone wanted, I was safe from pelf.

He had a slide in his talk showing an angel figure hovering over a person soldering away at a workbench, with the caption saying you didn't need divine inspiration to get projects to work. I didn't think anything more about that until I raced up after his talk to buy a copy of his new book *Minimalist Radio*, and a copy of the complete *Spratt QRP Journal* on CD. In the book was a series of plans that might just solve a problem I have been grappling with for more than a year — building an all-Radio Shack DC receiver with no mail order or rare parts.

The QRP show has a nice awards banquet, and a QRP flea market at the hotel. This was another shocking drain on my wallet, as there were many dozens (!) of kits, books, bags of parts, and other items on offer. They have a quaint custom of taping QSL cards on the door, so you can see who your neighbors are. An added plus is that the Ramada South was the first stop on the free bus route to the Hamvention.

I had an idea for the larger DX contingents visiting Dayton from overseas, which came to me after losing out on bargains on 20' telescoping antenna masts (\$10) and 4' army-surplus antenna masting sections (\$3), neither of which would fit in my carry-on luggage for the airplane home. They should get together and rent a standard 20' shipping container — it could be filled to the brim, customs-sealed, loaded on a ship, and unpacked back home.

The 1N914 as a varactor

It is a fact of modern life that variable tuning capacitors are getting harder and harder to find in local electronics stores. Radio Shack no longer

stocks them and they are even disappearing from the mainline mail order catalogs. The suggested replacement is in many cases the varactor diode. These are at least still being made, but require that one find an NTE dealer, or a well stocked parts store to find one locally.

In a number of the more basic QRP designs, you find some designers will use a common 1N914 diode or even a 2N3904 transistor (use the base-to-emitter junction) in place of a "real" varactor (VVC) such as the MV104. This is all well and good, but I have been trying to reverse engineer and update some of the older "all Radio Shack" designs, and have needed to find the capacitance range for the 1N914 in such an application.

In an article in one of the last issues published of *Ham Radio Magazine*, Hugh Wells has a nice table with the capacitance to voltage ranges for a number of common diodes, including the 1N4001 to 1N4007, and the 1N914. You can find the table on the *Ham Radio CD* published by the ARRL, or in your archives. I will give you a hint here — the 1N914 acting as a varactor is 0.5 to 4 pF, over an active range of 4 to 0.5 volts. So at 4 volts it's 0.5 pF, and at 0.5 volts it's 4 pF. Higher voltages did not change the capacitance. The 1N4001 had a range of 3–34 pF from 16 to 0.5 volts.

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Mark Milburn KQ0I, QRP ARCI, 117 E Philip St., Des Moines, IA 50315-4114.

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Breakdown in Cape Town

The surprise activity on this little jaunt turns out to be not just on the air.

When the bombshell landed that our DXpedition to the Midway Islands in April 2002 as W4M was to be canceled as a result of the hotel operator on the island ceasing their operations, Jim G3RTE and I looked around for an alternative and readily accessible destination.

We looked at the possibility of going to Grand Turk in the Turks & Caicos Islands (NA-003), which is relatively rare from the IOTA point of view, but VP5 sees a lot of holiday type activity from Providenciales (NA-002), which rather undermines interest in DXCC activity. As we were all considerably out-of-pocket following the Midway fiasco and a trip to VP5 would have been almost as expensive, we decided to put our plans for a 2002 DXpedition on hold.

Having decided to abandon a radio trip, I started to get big circular hints from Jan about going on holiday together instead. As we had already set our minds on going back to Madagascar in the autumn, we agreed it would have to be a cheap one! After much poring over brochures, we finally agreed on a very reasonably priced package of a week in Cape Town in late April, flying from London via Istanbul on Turkish Airlines.

Once the booking had been made, I sent a short E-mail to Al ZS1AAX

suggesting that we meet up for a drink and/or a meal. Al responded positively and suggested that we also involve Vidi ZS1EL and his XYL Hester ZS1ESU, N4MPQ. Several friends asked if I planned to take any radio equipment with me, but as our hotel was in central Cape Town, I decided not to. (Quite apart from the fact that I didn't think that ZS1 was rare enough to warrant the organization involved.)

We left Heathrow on the evening of Friday 19th April, arriving in Cape Town around 11 a.m. on Saturday



Photo A. Jan and Phil at Cape Point.



Photo B. Jan, Phil, and Vidi at Sandy Bay, the famous nudist beach (it was a very cold day!).

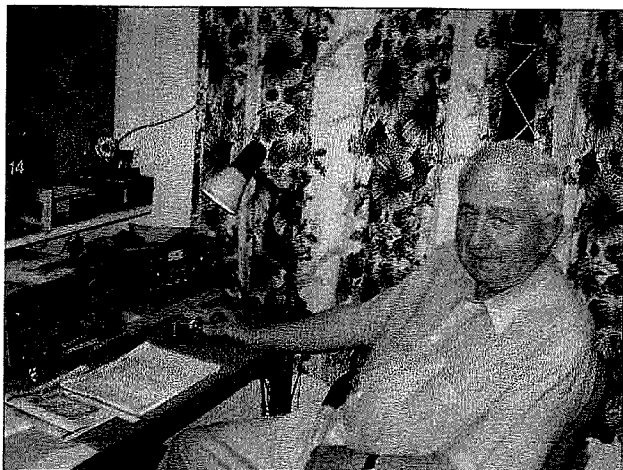


Photo C. Al ZS1AAX in his shack.

the 20th, having changed aircraft in Istanbul and touching down briefly in Johannesburg. Vidi and Hester had explained that on most Sundays they come into the city center from their home in Somerset West, to go to church and to visit the V & A Waterfront. Coincidentally, their church is quite close to our hotel and we arranged to meet at 11 a.m. in the lobby and to go to the Waterfront for lunch with Al, his XYL Kay, and his sister Stella.

The Victoria and Alfred Waterfront is still a working harbour, but much tasteful redevelopment has taken place and there are many restaurants, bars, and shops. Jan and I spent the first part of the Saturday evening exploring and having a meal — and the second part getting gloriously drunk on South African brandy in the hotel bar with another couple in our group. Heaven knows what time we went to bed, but I woke at 5 a.m. to find that all the lights in the room were still burning! After a late breakfast, Jan was still feeling hung over, but I was (surprisingly) fine.

Vidi, Hester, and Al all arrived as planned and we set off for the Den Anker, a Belgian restaurant at the Waterfront, where Kay and Stella joined us. A family of seals cavorting in the sunshine provided entertainment during the excellent lunch. Vidi asked if I wanted to play some radio during our trip, but we explained that we had a rather full schedule of sightseeing and had no time available. After lunch,

Hester proposed that we all go back to their house for coffee. Somerset West is about an hour's drive east of the city center and we were concerned about getting back to the hotel afterwards, as there appeared to be no public transport available. Al solved the problem by very kindly offering to drive out to Somerset West and then ferry us back to town in the early evening. Even so, it was a fairly devious route home for him, as he lives in Constantia in the southern suburbs of the city.

On arriving at Vidi and Hester's home, no time was lost in showing me the shack and firing up the rig. Vidi uses one of the beautiful N2DAN paddles, but I am a dyed-in-the-wool bug key user and have never got the hang of an electronic keyer. Vidi unearthed no less than three mechanical bugs from his collection and one was quickly pressed into service. A quick listen on 14 MHz at around 1400 UTC revealed a couple of W7s ragchewing on an otherwise dead band. 21 MHz made for a quick QSO with A25/DJ6SI, but 28 MHz was quite lively and a CQ call from ZS1/G3SWH was immediately answered by N2UI at 1445 UTC, followed by N4JF. After about half a dozen "normal" QSOs, a pile-up developed, mainly of Europeans, so I reached for a pair of headphones and dropped into 5NN mode. The pile-up grew and I was forced to work split at a good run rate, although I am still at a loss as to what was so interesting about a ZS station on 10 meters.



Photo D. L to R: Hester ZS1ESU, Phil G3SWH, Al ZS1AAX, and Vidi ZS1EL in Vidi and Hester's shack.

Al and Vidi were highly amused by my wrist action when using the bug, as using an N2DAN paddle is an altogether much more sedate affair. For the next couple of hours, I was plied with tea and biscuits whilst working 194 stations in 37 DXCC entities before Jan decided that I had been indulged enough and it was time for Al to drive us back to the hotel.

The rest of the holiday went as planned. Monday saw a birdwatching trip to the Paarl Mountain Reserve. On Tuesday we took a tour of the Cape Peninsula. We visited the Kirstenbosch Botanical Gardens on Wednesday in the pouring rain. Thursday was allocated to visiting the Winelands and no less than five vineyards, six if you count seeing the cheetahs at Spier. Friday dawned a beautiful day so we were up very early and took the first cable car of the day to the top of Table Mountain, which had been wearing its tablecloth (clouds) earlier in the week. That evening, we went to Al's home for dinner with his wife Kay and sister Stella, but didn't get on the air again.

Saturday, 27th April, was our last day in Cape Town and we were due to fly home late that afternoon. We decided to do little else but pack and some last minute shopping in Long Street as transport to the airport was arranged for 2:30 p.m. Jan particularly wanted to visit the Bead Shop. We didn't know until later that it was a

Continued on page 32



Photo E. Lunch at the Den Anker. L to R: Hester ZS1ESU, Vidi ZS1EL, Stella (Al's sister), Kay ZS1AAX/2, Phil G3SWH, Al ZS1AAX, and Jan G3SWH/2.

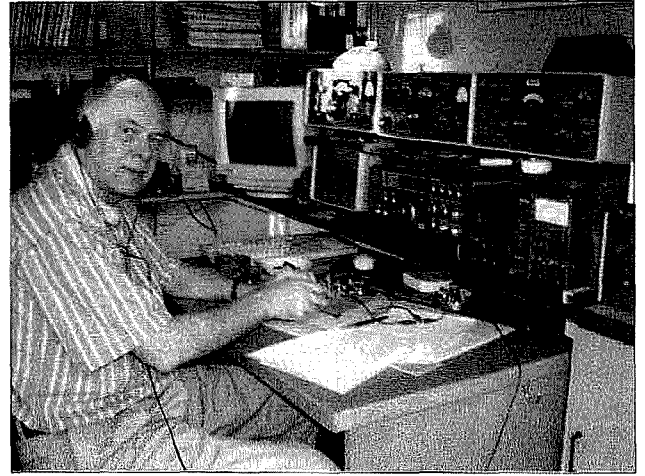


Photo F. Phil running a surprise pile-up as ZS1/G3SWH.

Breakdown in Cape Town

continued from page 31

public holiday and most of the shops, bars and restaurants on Long Street were closed, including the Bead Shop.

Somewhat disappointed, we looked around for somewhere to have some lunch and a final beer before leaving and spotted a couple from our group on the balcony of a bar called the Purple Turtle, only a few yards from the hotel. We waved and they beckoned us to join them.

We sat at the end of the balcony with my back to the handrail. I placed my camera bag containing the passports, tickets and a not inconsiderable amount of cash on the floor on my right hand side. Whilst engaged in a pleasant conversation with our friends, I was conscious of a group of Asian people at the next table and of one of them walking several times along the balcony to look over the handrail and signal to someone below, but as the balcony was quite a busy part of the bar, I thought little or nothing of it.

When the time came for a second round of drinks, I looked down and discovered that my bag was missing. It was obvious that I had been the victim of a very slick and professionally carried out robbery by the people at the next table but who were now, of course, long gone. We rushed back to the hotel and asked them to phone the police, but as there was only about 45 minutes before we were scheduled to leave for the airport, the

local police recommended us to report the theft at the airport, which I duly did. I then reported to the Turkish Airlines desk and was informed that re-issuing the tickets would not be a problem on payment of US \$50 each but they would not let us board the aircraft without passports.

We had no option but to return to the hotel, book back in our old room and start to make phone calls home to let our family know what had happened. Needless to say, we were unable to contact the British consulate or the airline office until the Monday morning. We also phoned Vidi and Hester and arranged to meet up with them again after church on Sunday.

We spent another very pleasant day with them, including a visit to the IMAX cinema and an excellent lunch at Hout Bay.

First thing on Monday morning, I telephoned the British Consulate and spoke to a very helpful lady who explained that we needed to get some passport photos and visit the office to get Emergency Passports issued at a cost of 510 Rand each (about £34). We also visited the Turkish Airlines office, which was fortunately quite close to the Consulate. On explaining our position we were told that there were flights on Tuesdays and Saturdays only, that the following day's flight was already overbooked by 10 passengers and that there was only one seat left on the next Saturday flight. The clerk did say that he thought that he

could probably get a second seat on the Saturday flight and would call us at the hotel later in the day.

We were fairly desperate to get home as soon as possible as both Jan and I had important business commitments. Consequently, we made inquiries in a bucket shop as to the possibilities of alternative flights home and in fact took an option on a South African Airways flight on the Tuesday evening. We also managed to contact our travel insurance company in UK and were told that our policy only covered the cost of the emergency passports, ticket re-issue fees, and replacement of my camera, etc. There would be no contribution whatsoever towards our necessary living expenses whilst waiting for a flight home, nor towards the cost of an alternative flight. We have held an "annual, multitrip with independent travel" policy with the same company for several years but it's at times like these that you realize that travel insurance never covers you for real situations!

When no phone call was forthcoming from Turkish Airlines, we called them, only to be told that all their computer systems were down and to call back in the morning. Next morning, the airline's computer systems were still down and they had no idea of when they would be back on line, so we took the only decision possible — to take up our option on the SAA flight that evening.

Continued on page 56

Hamfest Survival Guide

So that you can live to 'fest another day.

How do you survive a hamfest? Most of us would say that the hardest part is to avoid buying items we want but probably won't need. Others might justify their purchases but worry about avoiding a divorce when their significant others see them unloading a trunk-load of what they might consider "junk." Regardless of what it is that worries you about having fun at a hamfest, here are a few pitfalls and tips on how to avoid them.

Let's face it, there are times when the mere mention of a hamfest to our wives will elicit dour looks, regardless of whether or not we're actually going to buy anything. This may be because of an established reputation of dragging home items that, regardless of their actual worth, end up cluttering the house.

While there may be no way to instantly dispel such a reputation, there are ways to lessen the impact. A trip to the hardware store for parts cabinets and a bit of time with a typewriter to type up labels for the bins on these cabinets will go a long way toward sorting out the stuff we've accumulated in the past. Convincing the folks at home that we can keep our junk organized and off the floor also will go a long way toward allowing us to be able to sneak in treasures in the future. As a side benefit, it might even extend to helping us find something when we need it for a project, instead of making us buy it brand new even though we bought the same thing at a hamfest six months ago — but can't find it in the clutter!

Involvement

Family involvement can actually be

a benefit to surviving a hamfest. For example, even though my mom is not a ham, she's been curious enough about what I do, to learn at least a little about electronics, and ham radio. So, by telling her what the end results are that I'm aiming for — be it a search for parts for a given project, or a radio for a new mode of operation — she's gotten a lot more tolerant of the

stuff cluttering up the house if she knows that it's actually going to get used for something (instead of just taking up space).

Do I really need it?

Before anyone gets the idea that this is a "gimme"-only type of event where

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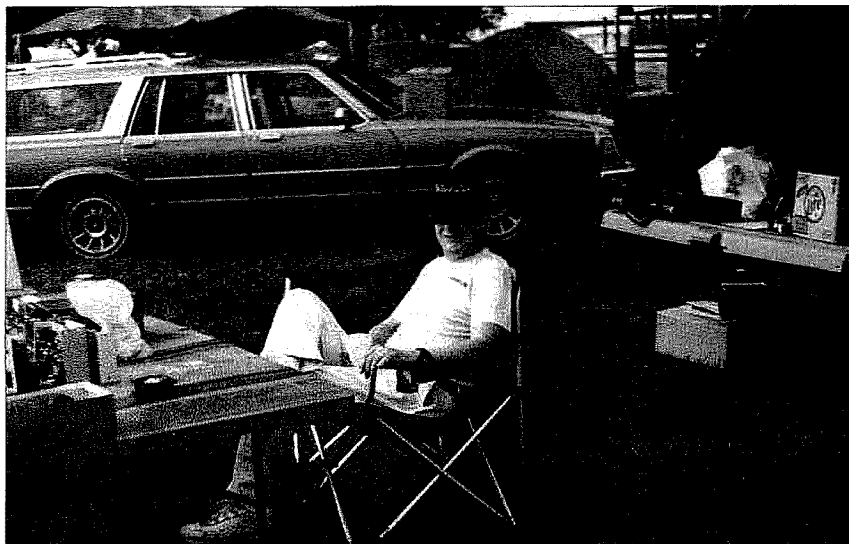


Photo A. Dave N9ZAZ shows how to properly set up for selling, to make it fun and survivable.

Radio Comm in the French and Indian War

*Anything's possible when the Military Radio Collectors Association
holds its annual meet.*

*DXpeditions in Indian country, steals and deals, and seminars on the radios that won
WWII were the highlights of the Military Radio Collectors Association's annual meeting.
MRCA is an offshoot of the Old Military Radio Net (0500 EST Saturdays on 3885 kHz).*

With no dues, no officers, and only one meeting each year, the 2002 meeting was held September 6–8 at the Gilbert, PA fairgrounds, in conjunction with the Red Ball Military Transport Rally — an arrangement which benefited collectors from both groups.

Flintlock and tomahawk vs. BC-611s

Steve Finelli N3NNG, MRCA Events Director, created a challenging field

exercise for Friday, September 6th. Two local passes, “Big Pocono” and “Little Gap” were of crucial importance during the French and Indian War, 1754–1763. Raiding parties used these passes to punish British settlements east of the mountains. Our objective was to establish communications posts at these two locations, each just over 10 miles from the MRCA base in Gilbert. From these posts, foot patrols would fan out, giving us observational security.

The Big Pocono team was led by Dale Gagnon KW1I; the Little Gap team was led by Al Klase N3FRQ (both shown in **Photo A** conferring on the best avenues of approach for each objective). Ted Young W3PWW remained at the MRCA AN/GRC-19 base station (**Photo B**).

On Dale's team were Mark “Brown” Beezer WINZR, Brian Neri WA2CWF, Dave Kormanicki KB3ELD, and me (KØRMK). On top of Big Pocono, we put Dale's BC-474 into operation. We

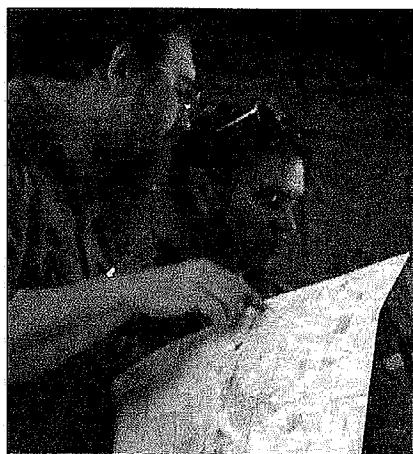


Photo A. Al Klase N3FRQ (at left) and Dale Gagnon KW1I plan DXpeditions.

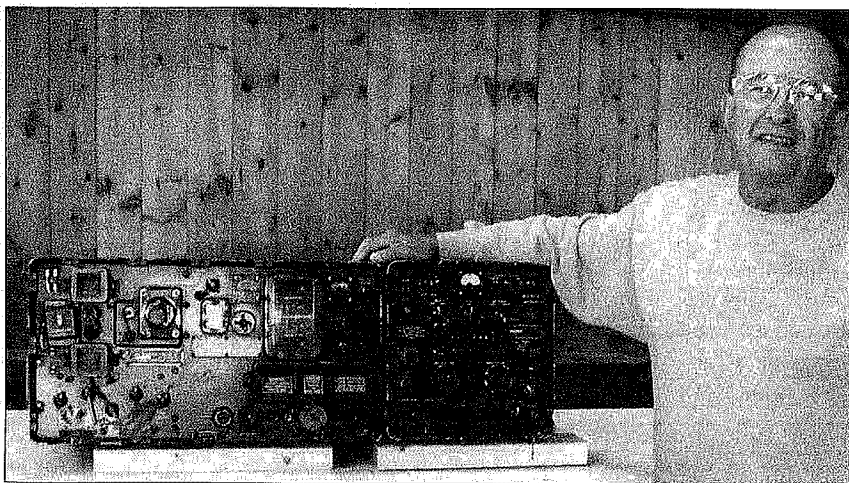


Photo B. Ted Young W3PWW setting up AN/GRC-19.

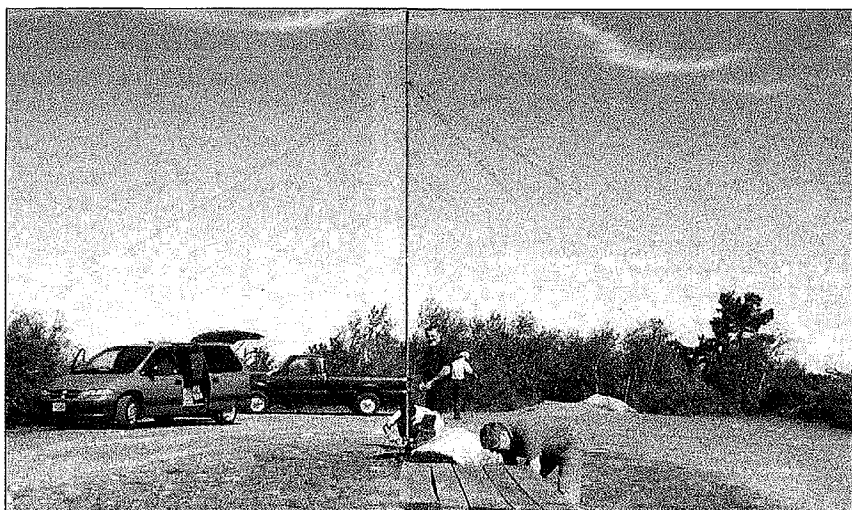


Photo C. "Big P" team from front to back: Dale KW11, Brown W1NZR, Dave KB3ELD, and Brian WA2CWF.

erected a 30-some-foot vertical antenna with a 4-wire counterpoise (two 33', two 60') laid out in the cardinal directions and connected to the vertical through a loading coil (**Photo C**). Power came from a Honda 300 watt AC generator at the other end of a very long extension cord to reduce interference. With 5 watts PEP, KW11 was able to establish contact with MRCA base using both CW and phone. With the BC-474 working, W1NZR and KB3ELD patrolled as far as 600' from our post on "Big P", remaining in contact using their BC-611s.

On Al's "Little Gap" team were Pete Hamersma WB2JWU, Stew "Bud"

Beckley WA2AUI, and Breckinridge Smith K4CHE. Their GRC-9 was powered by a GN-58 with WA2AUI doing the grinding. When the GRC-9 experienced receiver failure, one of the team's BC-611s was utilized as a receiver while K4CHE took the other on foot patrol.

It is my pleasure to report that our field exercise was a success. No French or Indians infiltrated while we were on post.

Steals and deals

The large military vehicle rally attracted quite a few dealers. Many of us were able to find bargains among what, to the undiscerning eye, appeared to be junk. KB3ELD found an M-1942 field desk in practically new condition — hard to find at any price, let alone what he paid for it (**Photo D**). Other finds included WWII headsets in original wrapping, manuals, and connectors of all kinds. Warren Harding K1BOX found a rare WWII J-47 telegraph key made by Lionel.

There were over 200 vehicle dealers and only five military boat anchor dealers, but there were some good buys on our side of the fairgrounds. While the going price was \$150 for a GRR-5, one sold for \$105 with all connectors, new original headset, new original antenna sections, and vehicle mount.



Photo D. Dave KB3ELD with WWII U.S. Army field desk.

Lessons and displays

The lead lecturer was Norman Chipps N3RZU. His presentation was so interesting and humorous that 15 minutes after he started I looked at my watch and found that an hour had passed. His subject was the TBX-8 used by the Navaho Code Talkers in the Pacific Theater (**Photo E**). From interviews with surviving members of the Code Talkers he found that the TBX was preferred because of its range, and it had a portable AC generator which could be used to power a fan, very desirable in a jungle environment.

Other presentations were "Enigma Cipher Machines" by Thomas Perera W1TP, "The Enola Gay" by Mike Hanz KC4TOS, and "Command Sets" by Gordon Eliot White, a long time contributor to *CQ Magazine*.

Nearly twenty functional military boat anchors were on display inside the fairground building. William Donzelli brought his TAV1, a pre-WWII Marine Corps radio. K1BOX showed us his "Pogo Stick" radio used by the U.S. Cavalry. N3FRQ had an AN/GRC-9. My BC-654 was there with legs, thanks to N3NNG. Other static displays included a Navy Model GO-9 aircraft transmitter and an SCR 178/179.

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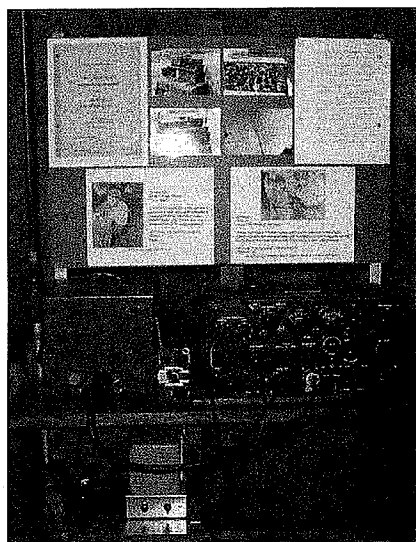


Photo E. TBX-8 below photos of Code Talkers.

CQ Sooner Spring

An emergency preparedness drill that was more than OK.

Immediately following September 11, 2001, the Tulsa Health Department commissioned an Emergency Preparedness Committee to review the emergency response capabilities of the department, and make improvements where needed. We realized early on that we would need an Emergency Operations Command Center (EOCC) to serve as our operations nerve center.

This article chronicles the transformation of an archived-records room into our EOCC, and our partnership with the Tulsa ARC to demonstrate the effectiveness of amateur radio during an emergency response, by staging a special event during a statewide bioterrorism drill in Oklahoma.

"CQ Sooner Spring, CQ Sooner Spring, CQ Sooner Spring." Call for an early spring? Not really. Celebration of spring in the Sooner State (Oklahoma)? Wrong again, although not a bad idea. Then just exactly what was that determined voice on 21.320 MHz celebrating? Freedom — sort of. That voice on 15 meters on April 13 was that of Dave Cox NB5N (Photo A).

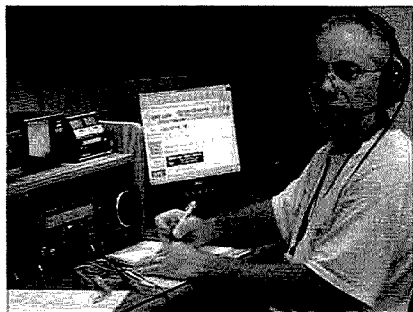


Photo A. Dave NB5N, EOCC station trustee, snags the CDC.

Dave, along with over 100 other Tulsa Health Department employees and 300 volunteers, was participating in an emergency drill code-named "Sooner Spring," simulating a response to a biological terrorist incident — specifically a smallpox outbreak.

In addition to Dave, over two dozen members of the Tulsa Amateur Radio Club (TARC) could be found on the grounds operating six portable stations ranging in frequency from 3.5 MHz to 440 MHz, voice and data, and on 900 MHz on ATV (amateur television)

(Photo B). The purpose of the portable stations, under the direction of the TARC, was to demonstrate the value of amateur radio in emergency communications. The purpose of Dave's operating, while limited in scope to exercise-related communications, was to christen the Tulsa Health Department's

newly constructed EOCC (Emergency Operations Command Center). Other control operators in the EOCC during the event were Cindy Kappel N5EMK and Pete Mann KF5RD (Photo C).

Until September 11, 2001, no one really thought that a release of smallpox was even a remote possibility. But, following the events of that horrific day in September, and the subsequent releases of anthrax in Florida and in the northeast, a resurgence of smallpox suddenly seems possible. And, the dedicated employees of the Tulsa



Photo B. TARC members.

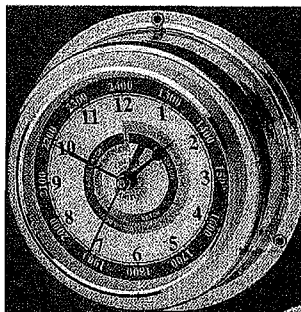


Photo C. Cindy NSEMK and Pete KF5RD, take a breather from calling CQ.

Health Department are actively pursuing every avenue available to make sure that they will be ready when, and if, such an incident occurs in their community — preserving our freedom, you might say.

As the lead agency in Tulsa County for response to bioterrorism, the Tulsa Health Department has significantly enhanced its emergency response capability since September 11th. A public health emergency preparedness plan has been drafted, epidemiology and environmental first-responder staff have been added, and a disease surveillance

system has been established. A critical component of their plan was the installation of their EOCC. While the EOCC is rather basic in design (Fig. 1), it is unique in character. In fact, EOCCs are virtually non-existent in local health departments. But, then again, the Tulsa Health Department is pretty unique in itself. According to Gary Cox, the director, "Tulsa's health department is considered among the top ten in the nation." And, he is quick to proclaim, "We aren't slowing down until we



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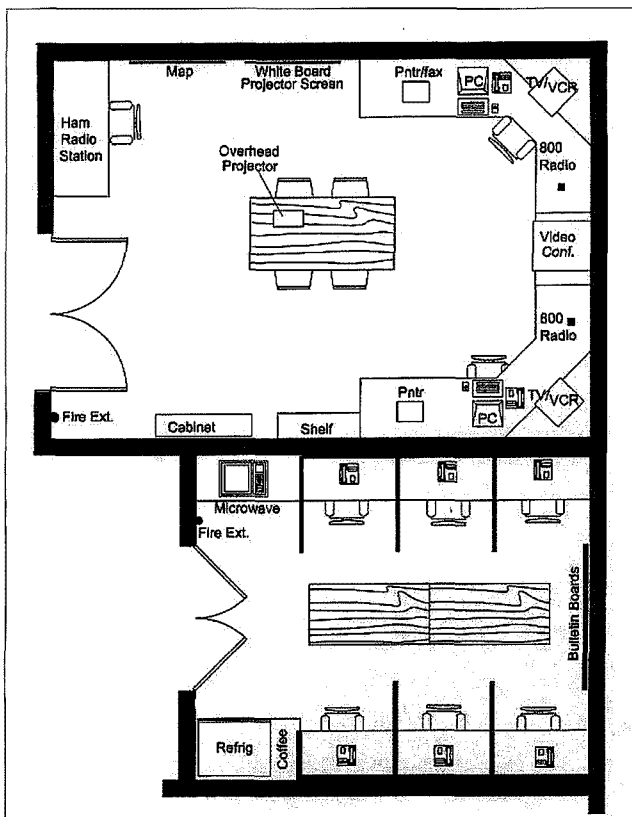


Fig. 1. EOCC floor plan.

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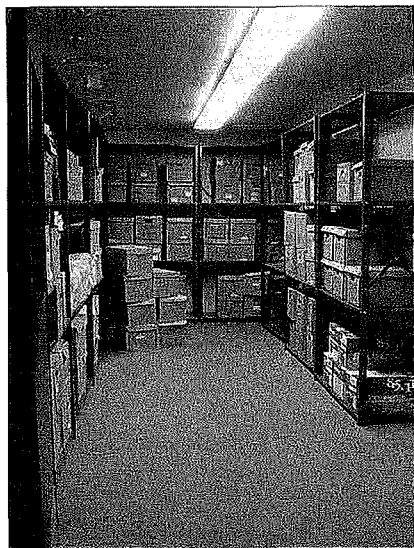


Photo D. Records room before conversion to EOCC.

hit number one." Clearly, their EOCC, and their partnership with the Tulsa Amateur Radio Club, will move them a step closer to their goal.

When the plan to establish an EOCC at the Tulsa Health Department was first conceived, the room where it is now located was used for storing inactive medical records (**Photo D**). Its location in the basement, adjacent to the telephone and computer network switching room, made it ideal. The elevator shaft was just a few steps away, offering an easy option for running coax to the roof three stories up. And, the roof of the elevator shaft would provide an ideal platform for mounting antennas. The bigger challenge came in outfitting the station. Weeks were spent researching equipment. Countless reviews were considered. Seasoned hams, communications specialists, and equipment manufacturers were consulted.

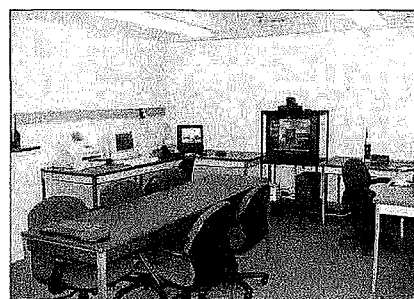


Photo E. EOCC duty stations (Records Room after conversion).

Station specifications finally fell into place a mere four weeks before Sooner Spring. Two things came out of our exhaustive research: First, every ham is of the opinion that his brand is the best; and second, virtually every major brand on the market today is excellent.

Going in, we only had three specific goals for the station:

- It had to be capable of providing the communications network that we needed — access to local emergency agencies, the Oklahoma State Department of Health 100 miles away, other local health departments throughout Oklahoma, the CDC in Atlanta, Washington, DC, and international. The Kenwood TM-V7A dual-bander (144/440 MHz) easily satisfied the local, as well as much of the state needs, especially with TARC's impressive UHF Super Links system, while the Kenwood TS-570D HF rig provided overlap for much of the state, reliable access to the CDC in Atlanta and Washington, DC, and international access for resource development and information sharing.

- The second goal was to provide equipment that would be easy to learn and easy to use, particularly in an emergency situation. We certainly didn't want an operator to be faced with the daunting task of having to learn an overly complex radio in the midst of a crisis. You have to admit, some of the rigs on the market today are incredibly complex. The TS-570D and TM-V7A fit the bill nicely.

- Finally, the station had to offer an element of intrigue. Of the 320 employees at the Department, only two were licensed amateurs. If we were to have a reliable reservoir of station operators, we would have to build internal capacity. To do that, we established the Tulsa Health Department Amateur Radio Club (K5THD), partnered with

TARC to provide license classes for all interested employees, and provided them access to the EOCC station for skills development and training. Within the first few months, nine employees had signed on. The capabilities of the Kenwood equipment, coupled with the reach of the Cushcraft A4S 4-element yagi, the Hustler 6-BTV vertical, and the Alpha Delta DX-A dipole, provided plenty of intrigue. And for good measure, and portable communication for the incident commander during an emergency, we threw in a Kenwood TH-F6A handie-talkie.

Having completed the configuration and installation of the EOCC, it was time to exercise its capability (**Photos E and F**). One of the goals that the State had set for Sooner Spring was to establish contact between Tulsa and the State Health Department, via amateur radio. Being uninitiated into amateur radio, they felt that this would be challenge enough. Our goal was a little more optimistic — to establish contact with the specific locations mentioned previously and to contact 30 states and 20 countries. This would serve as justification to the uninformed as to the capability of amateur radio.

The special event was staged from 1300Z to 2100Z on April 13th. The Department's two licensed amateurs were joined by two dozen TARC members. Over the course of the eight hours of operation, we exceeded most of our goals. In addition to contacting the

Continued on page 57



Photo F. EOCC ham radio operating position.

Lifeline for Your Driftmaster

How to stabilize a boat anchor.

Some tube-type equipment will drift to the point of distraction. When getting ready to operate, the procedure in my early days was to turn on the transmitter and receiver and then hope they would be tamed by the time I enjoyed my martini and dinner. It took a couple of hours with the station that was in the basement. My Driftmaster, in two-tone green paint, would continue to drift through the evening and the companion receiver was subject to the vagaries of room temperature and power line fluctuations. Using them on FSK, RTTY and SSB was an adventure in itself in that with tube equipment, it was always necessary to "spot" the frequency of the other station before the next transmission. I remember chasing the other station across the band most of the evening. The SSB phasing adapter was another story when three hands were useful.

Now, with increased activity on AM, some of the old boat anchors are being resurrected and used to good advantage, to the consternation of the SSB crowd. Also, the age of tube gear does not help stability characteristics. If the equipment drift exhibited by your station is satisfactory, read no more.

A partial cure to temperature drift problems is to use a 2k, 10 watt, wirewound resistor across the power switch. This will draw current through the primary of the power transformer and yield a little less than seven watts of heat. A winterized basement may need more wattage. A disadvantage is no control of the heater and a possibility of overheating equipment in summer ambient temperatures. I suggest using the technique only if you need it.

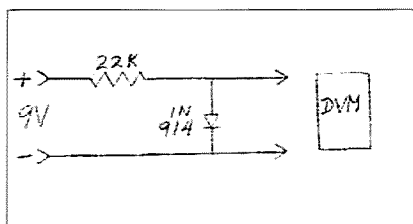


Fig. 1. Part of Fig. 2 (upper right corner) shows method of measuring temperature.

A rough measure of temperature change in the VFO compartment can be accomplished with the circuit, in **Fig. 1**, using a 1N914 diode, a resistor, and a 9 volt battery. A digital voltmeter will be most accurate for measuring the voltage change across the diode. As the temperature change increases, the voltage across the diode will decrease

at a near-linear rate, when the current flow through the diode is a few microamps. The 1N914 diode can detect a temperature change of 0.1 deg. F.

A typical diode-voltage-temperature curve is shown in **Fig. 2**. To measure temperature change inside a compartment, solder the diode on the end of a pair of wires and connect the circuit

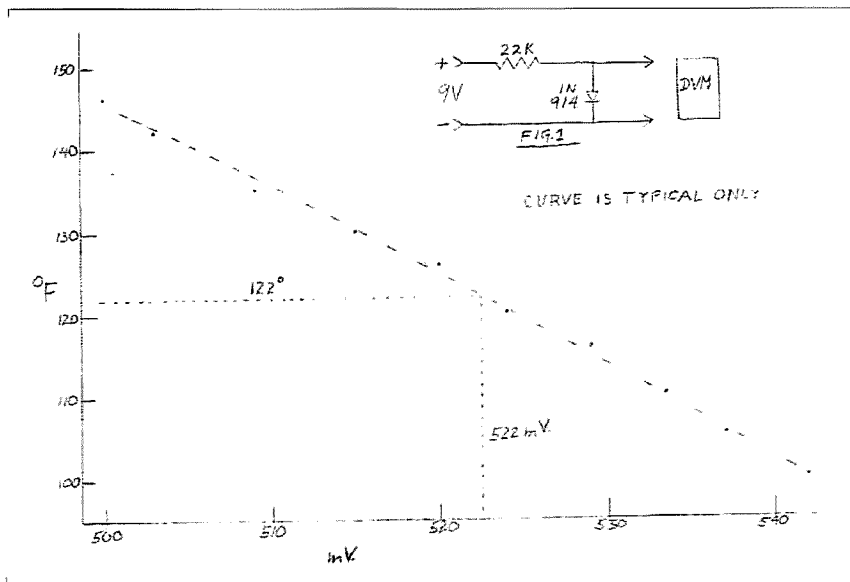


Fig. 2. A silicon diode voltage vs. temperature typical calibration, 100 to 150 deg. F. Use is to allow measurement of the equipment's internal temperature change when warming up.

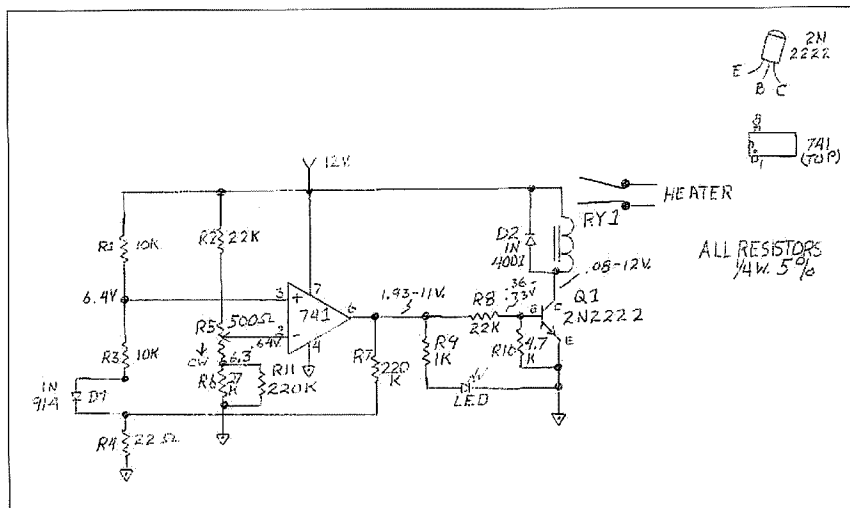


Fig. 3. Schematic of temperature control circuit for the Driftmaster system.

shown in Fig. 1. Note the ambient air temperature and the voltage across the diode.

Turn on the equipment and note the voltage change across the diode as the internal cabinet temperature increases. The diode voltage changes will indicate temperature change in the compartment. Not actual temperature, just the change. If you got this far, you really are a true experimenter.

A more scientific solution is to control VFO temperatures with a controlled heater. The schematic, Fig. 3, shows a simple circuit to control a heater placed in or near the VFO compartment. The temperature sensor is a 1N914 diode, which can be cemented or suspended inside or outside of the frequency control compartment. A diode can serve as a sensitive and stable temperature sensor when connected in the bridge circuit shown here.

How the circuit works

Refer to Fig. 2. Resistors R-1 through R-6, with the diode, form a temperature-sensitive bridge circuit. As temperature on the diode changes, the voltage difference (pins 2 & 3) across the bridge will change. If the currents through both halves of the bridge are equal, voltage across the bridge will be equal and output of the LM741, pin 6, will be low. The LM741 op amp is used as a voltage comparator/switch.

As the temperature on the diode decreases, the voltage on pin 3 compared to pin 2 will increase and the output on pin 6 will switch to near supply voltage and drive the 2N2222 to saturation or full-on by closing contacts in series with the heater. The relay will energize and switch a heater on. As temperature on the diode increases, voltage on pin 3 will decrease and the LM741 output, pin 6, will go low and turn the heater off.

The heater will be off until the temperature in the compartment, set by R5, lowers and the voltage balance at the input of the LM741 reverses and power to the heater turns on. Decreasing the resistance of R5 (turn CW) will lower voltage at

Part	Description (all resistors 1/4 W)	Radio Shack P/N (unless MSR, Mouser)
R1, R3	10k, 5%	271-1335
R2	22k, 5%	271-1339
R4	22Ω, 5%	271-1103
R5	500Ω trimmer	MSR 72-T20XH-500
R6	27k, 5%	RSU 11345147
R7, R11	220k, 5%	271-1350
R8	22k, 5%	271-1325
R10	4.7k, 5%	271-1330
D1	1N914	276-1620
D2	LED	276-209
U1	LM741 op amp	276-007
Q1	MPS 2N2222A transistor	276-2009
RY1	SPDT relay, 12 V coil	275-248
PCB	PCB	276-170

Table 1. Parts list, control circuitry (Fig. 3).

pin 2 (LM741) and will allow the bridge to balance at a higher temperature. Resistor R5 is used to set bias on pin 2 and control the switch-over point of the bridge circuit balance. The 220k resistor is used to introduce hysteresis and prevent chatter at the transition point of the LM741.

The sensing diode D1 and a heater element can be mounted inside or outside the VFO compartment. The diode sensor should be shaded from direct heat radiation of the heater and/or the VFO tube. Glass diodes are light sensitive and should be shielded from light for this purpose.

Circuit board construction

Photo A shows a prototype temperature control circuit board. The components can be mounted in any favorite method. This simple circuit's components can be surface-mounted in the latest Manhattan style on printed circuit material. One pain is cutting islands for component connections. Another technique is to use a Dremel electric tool to cut cross-hatch islands in the copper foil. I have also used strips or circles cut out of electrical tape and then placed in position on the

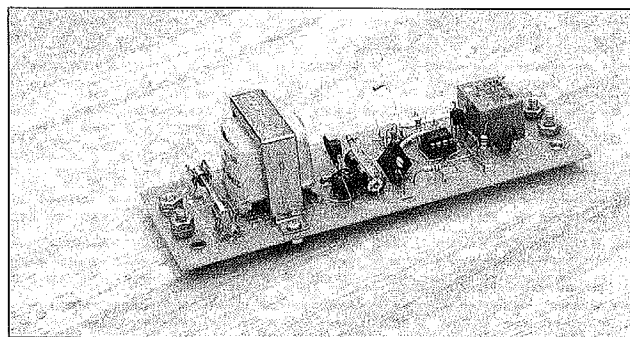


Photo A. Layout of all components on a Radio Shack 276-170 circuit board. Location of all parts is described in the text.

Components on the circuit board, **Photo A**, are, left to right — two #6 screws for 120 VAC connections to the transformer, 1/4 amp fuse, transformer, bridge rectifier, voltage regulator behind the disk capacitor, 220 μ F capacitor, 5k pot, and a cluster of parts associated with the LM741 op amp. The farthest end of the assembly shows the relay, 2N2222, and the LED indicator. The two #6 screws near the relay are for connections to the isolated normally open relay contacts to be in series with a heater.

Power supply

Fig. 4 shows the AC power supply that can be used with the Driftmaster circuit. If a 12 VDC wall transformer is used for power, all of the parts in **Fig. 4** are not necessary. However, if the 12 VDC source voltage, when unregulated, causes chattering at the transition point, add a zener or regulator IC to the circuit. The wall transformer will save space and simplify construction and mounting of the unit.

Testing your creation (smoke test)

For a heat source, temporarily connect a small lamp in series with the relay contacts, the two screws at the right end of the circuit board. The lamp for this test should not be more than 6 to 10 watts; a Christmas tree

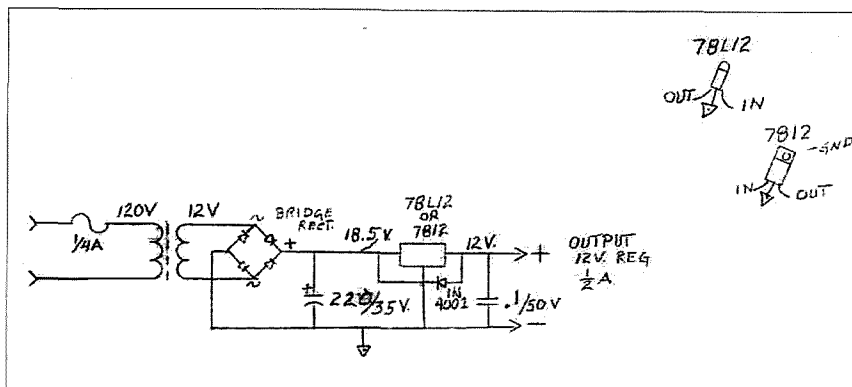


Fig. 4. Schematic of the power supply part of Photo A.

lamp for 120 volts or a small automotive lamp for 12 volts will work well. A small panel lamp would have enough heat for testing, if the room is not too cold. This will be a heater to check operation of the temperature sensing circuit. Note that the relay contacts are isolated from the rest of the circuit. As mentioned earlier, glass diodes are light-sensitive; therefore, protect the diode from direct light from any heat source with tape. For this test, the lamp should be near the diode, D1.

Connect 12 VDC to the Driftmaster circuit and turn the 500 ohm pot (R5) full clockwise and the lamp should come on. Turn the pot counterclockwise and the lamp should turn off. So far, so good? Set the pot where the LED just comes on. If you touch the diode, the heat from your finger should turn the LED off.

Place the heater (lamp) in contact with the diode and place a small cover over these two parts. Find a position of the pot (R5) where the circuit turns off and on automatically with heat from the "heater." Your control point should be above ambient room temperature. If R5 will not control the relay and LED, check the wiring, solder joints, connections, and components.

To use the Driftmaster, position the diode and heat source in or near the VFO compartment. The control circuit board can be located where convenient. Be sure wires to the heater and diode are well insulated.

This circuit has been used for temperature control of photographic baths, pool pump circulators, cooling control, and to prevent freezing.

The heater power (lamp, resistor etc.) required for your installation will depend on many factors. Equipment size, room temperature, and the heater power required to raise the internal equipment temperature to operating temperature, could vary greatly.

My thanks to W4GNC. Without his help, this document would have gross errors in spelling and punctuation. J.D. also made the photograph and you can blame me for the schematics. Trial and error, confusion, and blind faith will win out. If that prediction does not work for you, I hang around [w]tlz@arrl.net].

Part	Description	RS Part No. (unless MSR, Mouser)
C1	220 μ F, 35 V electrolytic	272-1017
C2	0.1 μ F, 50 V ceramic	272-135
F1	1/4 A 3AG fuse	270-1002
Fuse clips	Fuse clips	270-744
U2	78L12 voltage regulator — or LM7812	MSR 511-L78L12ACZ — or 276-1771
D3	1.4A bridge rectifier	276-1620
T1	120/12 VAC transformer	273-1385B

Note: If a wall transformer (wall-wart) is used, it should be rated for at least 300 mA at 12 VDC.

Table 2. Parts list, power supply (Fig. 4).

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CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the May issue, we should receive it by February 28. Provide a clear, concise summary of the essential details about your Calendar Event.

FEB 8

ST. CLOUD, MN A "Cabin Fever Reliever Hamfest" will be held February 8th, 9 a.m. to 2 p.m. at Holy Spirit School, 1615-11 Ave. South, St. Cloud MN. The St. Cloud ARC will host this event. Set up at 8 a.m. Tickets \$5, tables \$10. VE exams 10 a.m. to 12 noon for new licenses and upgrades. Talk-in on 147.015(+), backup is 146.940(-). Contact J. Maus W0MBD, 320-685-8295, or [w0mbd@arri.net].

FEB 9

MANSFIELD, OH The Mansfield Mid-Winter Hamfest/Computer Show will be held Sunday, February 9th, at the Richland County Fairgrounds, Mansfield OH. Plenty of prizes and an over 400-table flea market in three large modern heated buildings. Doors open to the public at 6:30 a.m. Tickets \$5 in advance and \$6 at the door. Tables \$12. Talk-in on 146.34/.94 W8WE. Advance ticket/table orders must be received and paid by February 1st. Send SASE to Dean Wrasse KB9MG, 1094 Beal Rd., Mansfield OH 44905; or call 419-522-9893 and leave a message for a return call. Info is also available at [www.MASER.org]. There will be a League Night banquet the night before the hamfest. More info on the banquet will be available on the Web site, or call Bill Martin N8TQ at 419-526-4661.

RICHMOND, VA The Showplace, 3000 Mechanicsville Tpke., will be the location for the "Richmond Frostfest 2003" Hamfest/Electronics Show, and the ARRL VA Section Convention. The Richmond Amateur Radio Telecommunications Society will host this indoor event which features a flea market,

national and local vendors, major manufacturers, and forums. Admission is \$6. You can get tickets and more info online at [www.frostfest.com]. Special VIP tickets are available before Jan. 25th for early admission and special entrance. Call 804-330-3165 to make reservations. Call 804-790-0077 opt 4 for general info.

FEB 22

LAPORTE, IN The LPARC Hamfest will be held February 22nd at Civic Auditorium, 1001 Ridge St., LaPorte IN, 7 a.m. to 1 p.m. Chicago time. Admission \$5, tables \$10. One admission included with each advance table reservation. Talk-in on 146.52 simplex. Contact Neil Straub WZ9N, P.O. Box 30, LaPorte IN 46352. Phone 219-324-7525. For table reservations, send E-mail to [tables@k9jsi.org]. Visit the Club Web site at [www.k9jsi.org].

MILTON, VT The Radio Amateurs of Northern Vermont is sponsoring the Northern Vermont Winter Hamfest and ARRL Vermont State Convention on February 22nd, 2003, from 8 a.m. until 1 p.m. at Milton High School, Route 7, in Milton, 5 miles north of I-89 exit 17. Features include a flea market, dealers, book sales, forums, demonstrations and refreshments. VE exams will be given at 9 a.m. and 1 p.m. Commercial exams at 1 p.m. Admission is \$5/\$3. Tables are free while they last. Check the Web site [http://www.ranv.org] for forum schedules and vendor setup info. Talk-in on 145.15 rptr. Bulletins on 146.67. Contact W1SJ at 802-879-6589, E-mail to [w1sj@arri.net].

FEB 23

ANNANDALE, VA The Vienna Wireless

Society's Winterfest will be held at the Northern Virginia Community College, 1 mile West on Rt. 236 of the Beltway, 8 a.m. to 3 p.m. Admission at the door is a donation of \$6. Plenty of tailgate spaces, and free general parking. Indoor tables \$20 each. Call Dave K3MV, 703-925-0584 for reservations. VE exams at 9 a.m. on Saturday, February 22nd. Walk-ins permitted. For further info check the Web page at [www.viennawireless.org].

MAR 16

JEFFERSON, WI The Tri-County ARC will host "Hamfest 2003", Sunday, March 16th, at the Jefferson County Fairgrounds Activity Center, Hwy. 18 West, Jefferson WI. Open to the public from 8 a.m. until 1 p.m. VE exams start at 9 a.m. Vendors will be admitted at 7 a.m. Vendors-only parking will be provided for unloading. Food and beverages will be available. Talk-in on the 145.49 rptr. Admission \$4, 8 ft. table space @ \$6 each. Reserve your space early! Contact TCARC, 213 Frederick St., Fort Atkinson WI 53538. Call 920-563-6381 evenings. Fax 920-563-9551. E-mail [tricityarc@globaldialog.com]. The Web site is at [www.cmdline.com/tcarc/].

APR 13

STOUGHTON, WI The Madison Area Repeater Assoc. will host the Madison Swapfest on Sunday, April 13th, at Mandt Community Center, Stoughton Junior Fair Grounds, on South Fourth St. Doors open at 8 a.m. Talk-in on 147.15. For more info contact Madison Area Repeater Assoc., P.O. Box 8890, Madison WI 53708-8890. Phone 608-245-8890. For fast access to more info, check the Web site at [http://www.qsl.net/mara/].

NEVER SAY DIE

continued from page 8

why a future physicist should have exactly the same education as an opera singer or furniture maker.

Begging Bowl

A recent letter from the League asked me to donate money "for the defense of amateur radio frequencies." For \$30 I'd get a certificate of recognition. They

already recognize me, so I saved \$30 right there. For \$50 I'd get a lapel pin. My hamfest hat is covered with "lapel" pins that nobody notices. For \$100 I'd get a coffee mug. Wow!

Look, guys, if you're really interested in defending our frequencies, how about doing something which will get more youngsters into the hobby? And maybe find out why around 85% of the licensed hams are inactive and what it would take to get them back on the air.

If we use our hands we're not as likely to lose them, but we've been coasting along for years, using about 3% of our bands, so we're sitting ducks for any moneyed lobby.

The League's long history of maintaining the code barrier to keep people out of the hobby hasn't led to a climate of trust, so I might feel a little more generous if I thought a

Continued on page 61

The Laser Communicator

What is all this talk about beam expanders for lasers? Are they necessary, and why on God's green Earth would I want to expand my laser beam?

Well, all this talk is a continuation of the laser communicator that was published (3 parts) in *73 Magazine* in June through August, 2000. The original article used an LED-based transmitter and was upgraded to include a small 650 nm red pocket laser. This provided greater output power, and while not a barnburner, was quite a simple step up in system ability performance and range. We used the laser barefooted without any accessories when we upgraded to the laser from the LED system. The next system upgrade was to add the "beam expander." The design of this entire system and the beam expander is the effort of Kerry N6IZW. It was his vision and dedication that have brought this project forward. There may be new developments on the horizon, but for now let's describe the beam expander.

The very name "expander" seems counter to what the job of a beam expander actually is. Its job is to collimate the beam into a very condensed focused spot of near parallel light energy, minimizing the divergence or spreading out of the laser beam. For example, at the distance of, say, 10 to 15 miles, the bare laser spot size could be in the range of 200 feet in diameter. Even with shorter tests at 100 feet in distance the laser spot has grown significantly larger and is spreading out like a flashlight beam of light. With the addition of a beam expander to this very same pocket laser, the spot at the 100 foot test point is focused to one of approximately the same size remotely as it is at the objective lens. What is happening is that the focused laser light is not diverging as much and is being more parallel in nature. Comparing it at 10 to 15 miles, the beam expander is making an observed spot size something less than 10 feet in diameter.

Beam expanders and the difference in laser light between a stock laser and one with a beam expander at 100 feet is very

noticeable. The bare laser light is not focused sharply and is a very dull, spread-out dim projection, while the same laser with a beam expander is quite focused, bright, and a near duplicate to the transmitted image — sharp in detail, defined even during daylight at 100 feet. What, then, does it take to construct a beam expander? See **Fig. 1** and **Photos A** and **B** for beam expanders that Kerry constructed.

A beam expander can be constructed from two lenses spaced to focus the laser diode output. (Reference articles can be found on the Internet. I searched in Yahoo for "beam expanders" and got a wealth of information.) The laser is centered from the first lens, be it a small diameter double convex or a surplus ball lens (looks like a marble) of short focal length (approximately 8 mm), to an objective of some 30 mm diameter whose focal length is about 80 mm. The focal length of these lenses is a good match for construction of beam expander material. The ball lens is quite easy to mount, as it has a surface outside edge of about one eighth of an inch flat — allowing easy mounting in PVC pipe whose diameter is cut to fit. (Ball lens used, from Surplus Shed, part #L1729, \$4 each.)

A beam expander produces a divergence reduction to the laser beam related to the magnification factor of the system. In this case, the system magnification factor is 10 and the normal spreading out of the laser beam, when used with such a beam expander, is reduced by the factor of 10. (Magnification factor equals main objective focal length divided by first objective focal length, in this case the [ball] lens. We then have 80 mm FL divided by 8 mm FL = magnification factor of 10.)

Testing a beam expander is not difficult at all, but a test range is needed. It can be either a short range or a very long distance range. For short optical test benches within

a garage, a measurement of laser spot size at the objective is carefully measured with a caliper, and the spot dimensions should be about the same at a distant target. For approximate positioning, space your first lens and objective some 4 to 6 inches apart (by experiment) and watch the laser spot size. This simple handheld range can demonstrate the effect of the system. By varying the distance between the lenses, a very fine spot can be observed remotely. This is not a correct adjustment. Vary the distance between lenses carefully to project remotely a focused spot size near the size of the spot on the face of the objective lens.

Once you get your optics somewhat fixed in place, the experiment can take a more exact form than simple handheld optics. Adjust the objective focus (distance between first lens and objective) for same dimensions at the remote target and objective face. This is not perfect but should get you in the ballpark of ascertaining the reduction or expansion in divergence of the beam on the distant target. Observation via a spotting scope can make some further evaluation desirable. Use a test range of several hundred feet and view the target with a spotting scope for spot size evaluation.

Adjust the target spot size to the same size as at objective (focus adjustment refinement). You want the output of the beam expander to be essentially flat out of the objective lens and the same image size at the remote test target. That's close to minimum divergence for the system. The laser driving the beam expander can produce either circular or somewhat rectangular patterns of laser light output depending on optics internal to the laser pen selected. There will be differences between the large variety of pocket lasers in the market. Just purchase a few different brands inexpensively and sort out what you

Continued on page 44

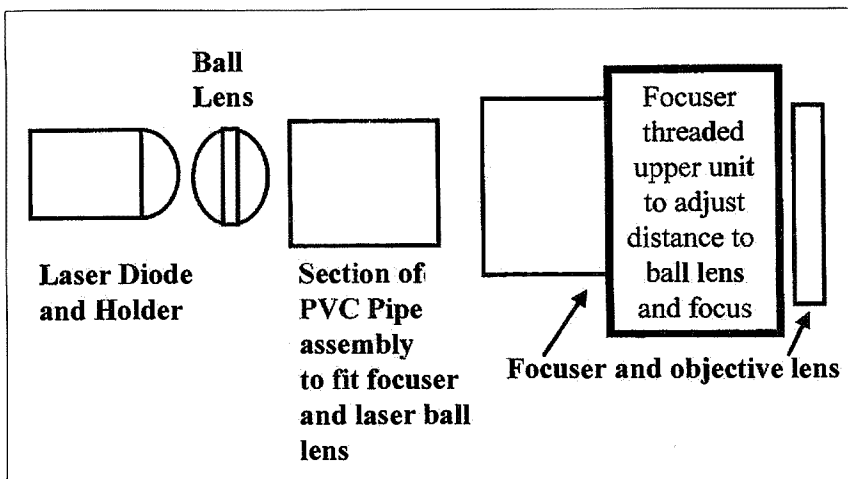


Fig. 1. Parts assembly diagram showing components of our laser beam expander and general idea of assembly using PVC pipe and pipe adapters to fit laser and first optical lens into focuser assembly. Adjustable side of focuser assembly holds objective lens. Layout is the same as *Photo A*.

ABOVE & BEYOND

continued from page 43

have to something usable for modulation capabilities and ease of modification.

Mount construction

A simple mount for a beam expander can be fabricated from PVC plastic pipe fittings and short sections of PVC plumbing pipe. The objective we used was 31.5-mm in diameter (1.240 inches) and fits into a 1-inch threaded adapter with some turning on a lathe. The ball lens used is 10.3 mm; 0.590 inch OD and PVC fittings can be machined to fit the lens and components of the focuser. Similarly the Laser Pen can be made to fit

tight into a selection of suitable PVC fittings and adapters, allowing the laser pen to be inserted at the end of these fittings. This end section will house the laser and ball lens together much like a collapsible telescope of short length. Bush out the far end and make an assembly for holding the objective lens spaced some 4 to 6 inches from the first lens, depending on optics used. For a first cut, position the objective in a simplest mount or other holder and handhold the ball lens and laser to obtain a starting separation distance between lenses.

While visiting a local surplus store, I found a mount that allowed the laser and ball lens to be held in one end of a focusing mount, and the objective in the adjustable front section. This gave us fine tuning

adjustment for proper system focus once we determined the approximate distance required between the first primary ball lens and second objective lens.

It's best to experiment first, with a simple optics test bench and some simple PVC holding mounts, to determine lens positioning dimensions. Then a final system can be assembled with only small changes needed in final focus for desired reduction in laser divergence. Once completed, it can be mounted and permanently fixed with the mounting for our telescopic sight as one unit. Allow for adjustment for vertical and horizontal positioning — to align both the rifle scope and laser together. Use the target I constructed in last month's column (Jan 2003) to accomplish this task.

A lathe could be used to great advantage to cut precise mounting insertion diameters in the soft PVC pipe and fittings for the lens elements so that they will insert tightly into each other. The lenses are then held by compression or glued in place inside the PVC elements holding them in place. Besides being inexpensive, PVC is soft and easy to cut, especially if you have access to a lathe. Then you can custom fit the plastic parts inside each other by machining them to exact tolerances.

The laser pen is modified by removing the bottom battery holder and making electrical connection to the spring and case to replace the battery connections with leads to the power supply driver. The on/off switch on the side of the laser diode assembly is jammed "ON" by a tight wrap of electrical tape. Most laser diode pointers are about

Continued on page 58

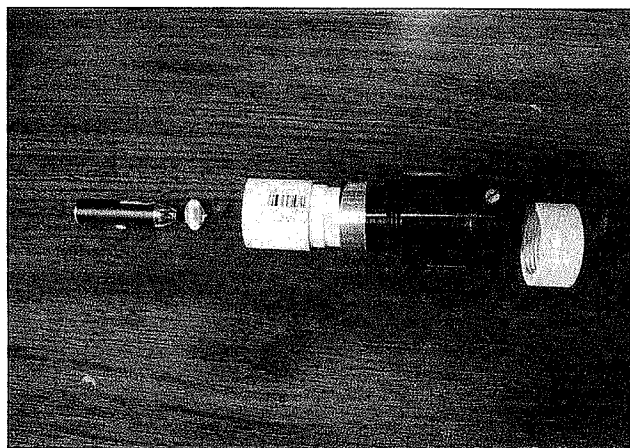


Photo A. Picture of components of our beam expander before assembly and fitting. Parts machined to tight fit in metal black-focuser assembly we obtained surplus. Component parts laid out left to right: laser, ball lens, PVC pipe, focuser, objective in PVC bushing to fit focuser.



Photo B. Picture of another beam expander using old objective portion of spotting scope with the laser and first lens in PVC pipe at far left showing diversity in construction that also works well. It's the optics, not the construction methods.

The Code Mode

You hear a lot of talk about what programs work best for certain purposes. As one ham mentioned recently, this is akin to discussing religion. The latter is definitely a ham no-no, but the former can really bring an on-the-air discussion alive. Usually everyone leaves in a good humor, because, regardless of the opinions expressed, it is understood that they are simply opinions.

I write some of this opening statement because I realize you readers each have your own thoughts on hamming with CW. For a long time, that was my favorite mode because I found great success with a modest station and it has always been an easy mode for me. That last part sets me apart as one of the more fortunate hams who simply did not have to struggle to pass all those code tests.

That aside, things have changed. I got into and became instantly addicted to these digital soundcard modes, and let the CW slide. Still, to me, it seemed folks should do CW the old-fashioned way. That is, with earphones, sharp filter, pencil, lots of paper and a manual log. I had looked at a few keyboard CW programs and was not overly impressed. The decoder between the ears always won the receive end.

Why CW software?

Then I got to wondering why there are so many pieces of software written lately to perform this task, and suddenly it came to this old ragchewer there is another side to all this. Some hams engage in a sport called contesting and they do that on CW also! It surprises me what comes to mind when I engage the brain cells.

Well, to get into this and get it said, the CW software that seems to receive the most accolades that is strictly written to be used for CW is CwGet and CwType, available from the DXSoft Web site found via *The Chart* on the Web. These two programs work together and also with the AALog, which is found at the same Web site. You get all these, and you have about as good a setup for working modern-day, soundcard CW as can be found.

I am only displaying the receive portion

(CwGet) for the article because that, to me, is the critical part of the setup. The CwType is the transmit program, as you probably guessed, and it has the expected macros, 36 in all, and the necessary parameters to adjust the sending speed as you would expect. In fact, a screenshot of the CwType and AALog would be very reminiscent of the December shot of TruTTY and AALog. The AALog is an excellent log program, as I mentioned in that article.

CwGet is quite a work of art in its own right. It looks simple in the screenshot. I added color to two of the backgrounds just to break up the large white area. Colors are fully selectable by the user.

The simplicity fooled me for a minute. I fired this up on a day when there was very little activity in this mode. I ran across a small DX pile-up and a few ragchew QSOs and mostly very weak signals. Even the pile-up was educational. You will see a few buttons that are labeled "GoToMax" and "AutoGTM" — very well thought out.

These two controls are very useful when trying to keep an eye on the quick interchanges. Since CW operators are not so oriented as PSK ops to being exactly on frequency, it is very handy to have the cursor leap automatically from one strong signal to the other instead of you trying to do it mechanically with the tuning knob or mouse. I noticed the change would usually take place and lose maybe two characters from the beginning of the next station's text. Score one for the software.

Most of the signals were registering about S-nothing to S-2 so I felt this was a good test day. Often, I have tried CW reception with other software and the only thing I could copy was "perfectly" sent machine code such as from WIAW. Today, I got to

observe signals that were a little "iffy" for ear detection plus I got to see what that Threshold setting was used for in the oscillograph at the bottom of the screen.

Actually, that threshold setting was my very first learning experience with the software. I tuned across a few signals that were quite well defined in my ear and saw they were not printing on the monitor. Even though I had read the rather brief instructions in the Help File, it did not matter — I still had to put the brain in gear and think about what had been said.

The screenshot has the AutoThres button activated so you cannot observe the line that was drawn in the middle of the oscillograph before that button was clicked. I experimented at first with moving this line down below the peaks of the decoded signal, and "Bingo!" — print magically appeared.

Even though the author does not claim the Auto Threshold control to be as accurate as he would like, I found it does amazingly well dividing the good stuff from the bad, as the print was doing pretty well toward the bottom of the receive pane in the screenshot. And, by the way, the signal was reading S2 on that last few lines. I believe the speed was about 22 wpm.

I also found a station sending CQ at about 15 wpm with an S0 reading and the decode on that was about 80 percent. I think some of it was timing, probably using a paddle by the sounds of it, plus there had to be some noise factor. What was happening in that case was some of the dits and dahs were being swapped to adjacent letters and confusing the issue. But, even so, this was pretty good considering the marginal conditions.

All in all, this is excellent CW receive software and it has its place for the modern-day ham who uses other such software

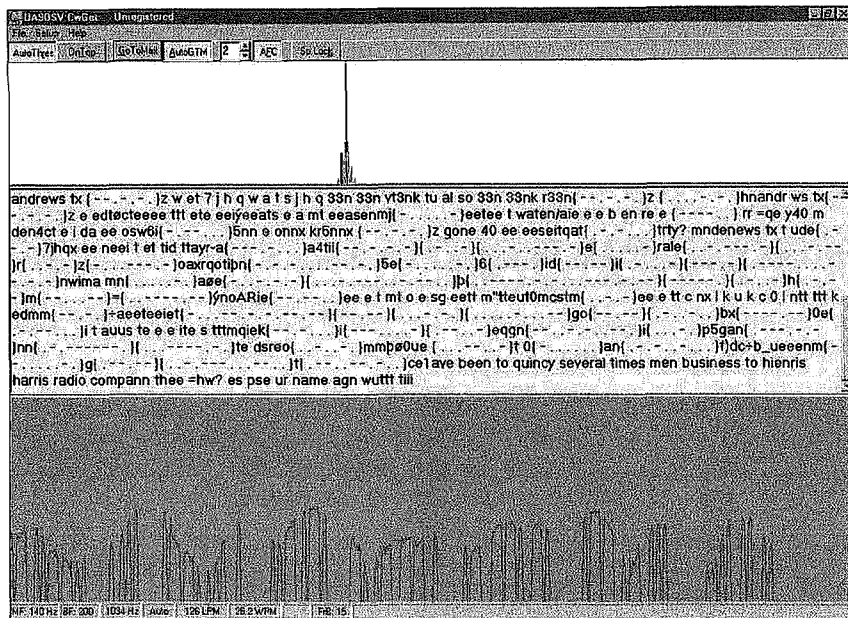


Fig. 1. CwGet — This is a receive-only program that integrates with CwType and AALog (see text). I feel the receive software is the most critical and this program receives the highest praise from users. It does a pretty fair job of copying CW under marginal conditions. You see readable print on the last few lines and this was about an S2 reading on the S-meter. The oscillograph at the bottom is a necessary pane. That allows a manual adjustment of the threshold (indicator does not show here because it is in auto mode). It is a lot of the secret of getting good print. The author has built in some very well-thought-out features. You will notice the “blank” spaces where the print does not exist. When unrecognized code comes into the program, it displays the dits and dahs so you may try to make sense of it if it is critical, such as a callsign. Also the Go To Maximum Signal option is very handy (see text). You can download this software and give it a try before registering. This copy is unregistered.

and wants to get in on some of the CW action, keep a log, and do it the easiest way possible. You still need to know the Morse code, but there again, if you use this program long enough, I guarantee you will increase your skill in this area and enjoy it all the more.

Lest I forget to mention (and I was), the CwGet is shareware at \$35, but the CwType, with all its attendant bells and whistles is free for the download! The AALog; I just

checked, and it has a price posted of \$49. If you recall from the December article, I was able to get AALog up and strutting its stuff with an unregistered copy. Today's CwGet screenshot is also unregistered. This means you can give this combo a pretty fair test before you spend your hard-earned ham dollars.

New stuff

Now that we are past the fun part, I will tell you of some of the things that are in progress and their attendant challenges. Different areas seemed to fall apart the last week or so and I have not found all the fixes for them as yet.

One silly little nagging problem started a day or so ago when, out of the blue, this computer stopped communicating with its modem. At this writing I am having to use another computer to get on-line. Sometimes that can be quite an inconvenience, but hopefully I will find a solution for this minor annoyance in the next day or so. But that is small stuff — not to sweat, as they say.

The Linux ordeal proceeds. As I mentioned

last month, I bit on one of the little cheapo computers from Wal-Mart on-line. They have (had?) a little Microtel unit loaded with the Lindows operating system for \$200 without a monitor or modem. If you buy one of these, believe me, you need the modem. It is the heart of their service (sales) platform.

Also, I found I needed a fairly late-model monitor capable of at least 800 x 640 (best with 1024 x 768) resolution. I tried two old monitors here and had to settle in with swapping the new 19" monitor back and forth with this computer. But it is working. Sometimes this ham shack resembles a used baling wire repository. If the government looked in here they might suggest this as a candidate for the nuclear waste dump. Gotta clean up my act <grin>.

The story on the modem is that there are so few modems that are Linux-compatible that it is best to order the computer with it installed to get the right one. I installed the wrong one and had to pay extra to get them to send the correct version. Later, I ran across a Linux info sheet of about five pages explaining why this was necessary. Not worth repeating here, just take their word for it.

The real thrust of Lindows appears very good on the surface for an average wannabe computer user who knows he has to have a computer “because everyone’s doing it” but is not sure what to use it for once he gets it. The Lindows folk have an extensive library of “free” (well, read on) Linux software they have configured for download to their customers that includes automatic installation at the end of the download. You simply start the download and when it is done you are ready to use the software. Very slick for a Linux project.

Now the downside — it is not for hams. I downloaded a few of the Lindows packages, because you get your first ten downloads free, and was really impressed. Then I tried to install KPSK, which is not from the Lindows arsenal. The best I can see, it cannot be done. I verified this with an experienced ham Linux user when I sent him a copy of the failure execution lines.

I should mention the cost of the free Linux software from Lindows. After the first sampling of free downloads, you are invited to purchase a membership for about \$130 that includes capability to download anything in their library plus some updates and other benefits. It is a pretty good deal for those folks mentioned above, but still won't help you one bit with the ham applications.

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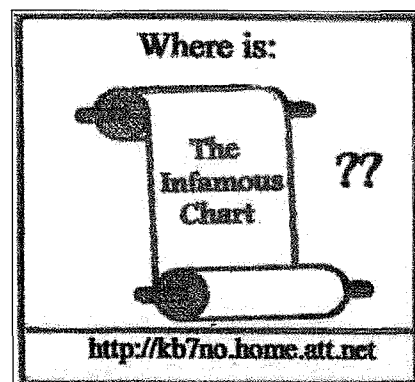


Fig. 2.

The Ham in Winter

Wintertime offers a few special opportunities for the radio amateur. It's too cold and gets dark too early to spend much time outside, so climbing towers and adjusting antennas is often not too practical. Likewise, for many of us, this is not the time of year to be installing a new rig in the family automobile.

If we take those off the list, what are the opportunities for the ham in winter?

1. Spend some time with the local ham club. With the emphasis on amateur radio's support for emergency or public service communications, winter is an excellent time to have a face-to-face QSO. Get to know the people in your local club so that you can be a better asset in case amateur radio plays a part in a local event. If you've gotten out of the habit of attending meetings, you may be surprised at what the club is doing these days. There may be special support for the local Weather Service office or some other special event.

2. Be an Elmer — While the local club may run a class to help people get their licenses, many new hams may have difficulty using that license once they get it. In the event of an emergency we will need every operator to help out. Many new hams never develop the proficiency they need for everyday operations, much less to help out in an emergency. Remember suffering from a bad case of "mike fright" when you first got your license? It's as normal for new hams as it was for us. When I got my license, a couple of local hams held my hand through my first QSO. As a Novice class ham, I was limited to CW. One of the guys was at his rig across town with his two-meter at hand. Another was at my station. They used the two-meter rigs to make sure we were on the same frequency and correct any problems. The QSO went without a hitch, even from the perspective of a brand new ham. After getting past that first contact, I was much more confident and had no nervousness about getting on the air for my second time. Contact the instructor for the license classes and offer to help some of the current students or recent licensees. In some cases, this

will help a ham get active rather than just being a listener with a license. Likewise, some new hams never get past two meters because they never get a chance to see the fun of HF operations. Invite these folks over to your shack and act as control operator so they can make a DX contact and get bitten by the bug.

3. Do an equipment inventory — Go through the treasures of your ham shack and take a good hard look at what you're not using. Some hams would then sell those items no longer being used, but let's face it — the rest of us are pack rats. However, that old item may be able to get some good use in someone else's hands. Perhaps the club could act as a lending library so that new hams could borrow a piece of equipment for a few months to help them get experienced with operating. If the rig hasn't been used for a while it may need to be cleaned and adjusted. If you need to do that, why not have the intended borrower work with you so you can explain the features of that particular radio and why certain tests or procedures need to be done. If you are one of the more technically advanced club members and/or have access to a wider range of test equipment, perhaps you could be the person to coordinate this. The old-timer with an unused rig in the basement gets his radio checked out, the new ham gets some great training and the use of a rig. Besides, you'll have a much better idea as to what equipment may be available for use for a special event station or in the event of an emergency.

4. Join a net or two or three — Besides the ARES and RACES emergency nets, many repeaters host swap and shop nets, old-timer nets, weather nets, etc. If your repeater is quiet too often, why not think about starting a net that would benefit the

local community in some way. If nothing else, there should be a net to keep people familiar with net procedures. While moving to Wyoming, I had a hiatus from net procedures, particularly with regard to Navy MARS. I like to think that I'm a fairly competent operator, but I was appalled at how rusty I had gotten and how I had forgotten a lot of things. Smooth operating is like playing a musical instrument — it takes constant practice to stay at the top of your form.

5. Monitor the local emergency frequencies — There are procedures for LiTZ (long tone zero) in the repeater directory so that someone in need of assistance presses and holds the zero key on their two-meter rig for about four seconds to signal that they require assistance. This was originally set up for the simplex frequencies but now some repeaters are set up to respond to the LiTZ code. This does no good if no one is monitoring the frequency. Find out the LiTZ procedure for your area and monitor those frequencies on a regular basis so that if someone needs help, we'll be there to lend assistance.

6. Learn something new — Take a technical course at the local community college. Many adult education courses are offered as non-credit as almost a form of entertainment. More and more educational opportunities are available via the Internet as "distance learning" courses. The American Radio Relay League (ARRL) is offering continuing education courses on-line for a modest fee, starting with emergency communications [<http://www.arrl.org>]. Naturally I recommend this one, but if the last time you used Ohm's law was when you were studying for your license exam in

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2002 AMSAT Space Symposium

Every year AMSAT, the Radio Amateur Satellite Corporation, holds a symposium and annual meeting. It's an opportunity to review the events of the past year, discuss current operations, and plan for the future. This year's event was held in Fort Worth, Texas, at the Lockheed Martin Recreation Area (LMRA). AMSAT past Vice President of Operations, Keith Pugh W5IU, was the Symposium Chairman.

Satellite enthusiasts began arriving at the Amerisuites Fort Worth Cityview Hotel early on Thursday, November 7th. No presentations were scheduled, but it was a great opportunity to register, and check out the Electronic Surplus Stores tour of the Dallas/Fort Worth Metroplex.

Friday

The AMSAT Symposium and Annual Meeting is not a hamfest, but is similar to a gathering of professional engineers that just happen to be hams with a passion for cutting-edge, space-based communications. A few displays were in evidence just outside the main meeting room for The SETI League (Search for Extraterrestrial Intelligence) and AMSAT. Bob K5GNA had 2.4 GHz downconverter systems and components for sale. A few other electronic distributors were also in attendance with

esoteric microwave gear and hard-to-find parts.

An antenna test range was set up in a nearby softball field. Many UHF and microwave antennas were tested by Kent Britain WA5VJB. Al Ward W5LUA was inside with gear to measure preamp and downconverter noise figures and conversion gain. For those who remembered to bring their favorite homebrew or commercial antennas and electronics, it was a great opportunity to get some accurate measurements by the pros.

Robin Haighton VE3FRH provided opening remarks for the beginning of the 20th Annual AMSAT Space Symposium and General Meeting at the LMRA. Robin stressed that the future of AMSAT's projects is directly related to donations from the AMSAT membership. Robin also congratulated the designers and builders of AMSAT-

prior to the first presentation by Anthony Monteiro AA2TX.

Tony has built some simple S-band disposable antennas for AMSAT-OSCAR-40 reception. Using such exotic materials as cardboard boxes and aluminum foil, Tony's pyramidal horn creations work well. Tools needed are as simple as the materials: single-edged razor blades, a tape measure and some marking pens. Left-over foil and cardboard, after the initial horn construction, can be used to make a disposable transmit antenna. A corner reflector and dipole for the 70-cm uplink on AO-40 takes care of any remaining material. Tony pointed out that if you have a lot of leftover materials, you can make a really big corner reflector for more gain. While the original corner reflector had about nine dB of gain, the large version had 14 dB, thus providing good-quality contacts out to apogee (60,000 km). The results have been great. Easy DX and quality contacts with nothing more than household materials for the antennas have inspired a number of curious variations.

Gould Smith WA4SXM followed Tony with an informative talk about the effects of environmental factors on AO-40 S-band reception. The bottom line was avoid buildings and trees. The attenuation caused by foliage is substantial at microwave frequencies.

Dr. Paul Shuch N6TX of The SETI League provided some thought-provoking insight into the use of small 10-foot surplus dishes to monitor 1420 MHz for the possible reception of extraterrestrial signals. Project Argus was begun in 1995 in an attempt to coordinate 5000 receive stations covering the sky. Paul's new focus on

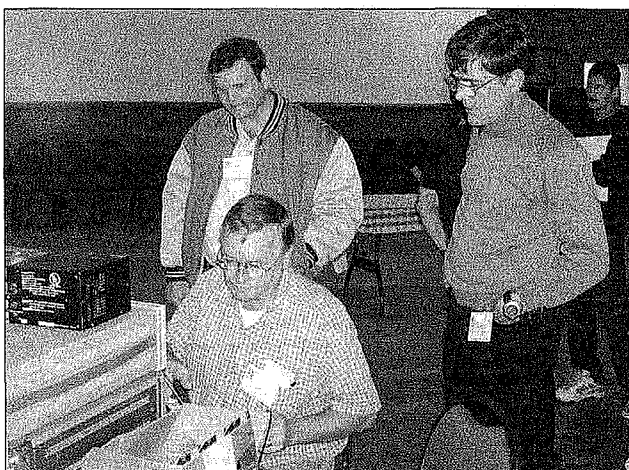


Photo A. Al Ward W5LUA tests another 2.4 GHz preamp while Fred N5JXO and Andy W5ACM watch at the 2002 AMSAT Space Symposium in Fort Worth, Texas. (K5ENG photo)

OSCAR-7. The rebirth of AO-7 was an amazing highlight of 2002. Pat Gowen G3IOR was the first to report the mysterious signals on 145.975, which were later identified as telemetry from AO-7 after over 20 years of silence.

Keith Pugh W5IU and Doug Howard KG5OA welcomed those attending to the "better half" of the Dallas/Fort Worth Metroplex and gave some symposium updates

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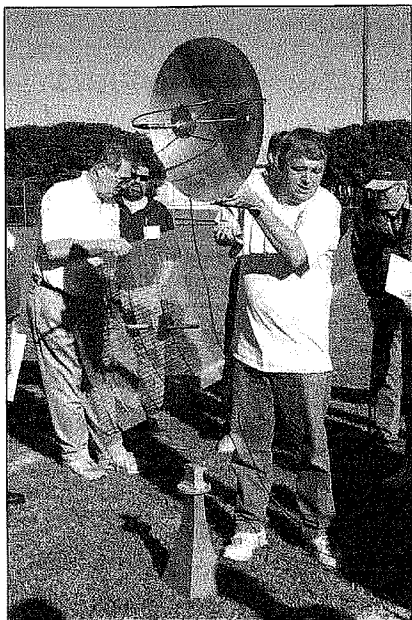


Photo B. Kent Britain WA5VJB checks the gain on a circular-feed dish for AO-40 reception on the antenna test range at the Lockheed Martin Recreation Area.

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the Very Small Array (VSA) design is a prototype system that incorporates eight 1.8-meter dishes complete with mounting hardware and other components. Paul showed photos of the installation of the dish array and discussed plans to finish the needed electronics to put the VSA into operation. More information about The SETI League and their projects can be found on the Internet at [www.setileague.org].

After lunch, Doug KG5OA introduced the AMSAT-OSCAR-7 team and paper presenter Mike Seguin N1JEZ. Mike has been

working to send control commands to AO-7 using gear that has been lying dormant for over two decades. He discussed the long history of AO-7 since launch in November, 1974. AO-7 had a design life of three years. It lasted 6.5 years in its first incarnation. Jan King W3GEY, Perry Klein W3PK, Tom Clark W3IWI, Dick Daniels W4PUJ, and Art Feller W4ART provided first-hand anecdotes and personal insights while Mike showed slides of the various components inside AO-7. This still-functioning antique hamsat is the oldest functioning satellite built with CMOS (Complementary Metal Oxide Semiconductor) integrated circuits. It is also a shining example of what can be accomplished by dedicated volunteers.

Gene Chapline K5YFL followed with his presentation on "How Kids Can Talk to Space People (Who are Aboard the International Space Station)." Gene described the process of scheduling and successfully completing school contacts with astronauts onboard the ISS. It's not a trivial process, but Gene did a great job distilling the events into a succinct description.

Kent Britain WA5VJB captivated the audience with his talk on the fads and fallacies of antennas. Metal booms and coax lines have very little effect on satellite antennas when the antenna elements are not parallel to the supporting boom. Varnished wood is better than PVC for antenna construction. Kent put an end to many pieces of antenna misinformation.

An intriguing ground station was recently constructed by Bruce Paige KK5DO and Jerry Brown K5OE for use by Ed P5/4L4FN in North Korea. Ed has been operational on the HF bands, but with the new gear, Ed would hopefully be able to provide some excellent DX for satellite enthusiasts. The station consists of a typical BBQ grill-style

antenna with downconverter for the S-band downlink and a short linear yagi for the 70cm uplink. Bruce showed photos of the system that was configured to be small enough to ship, yet still be effective for AO-40 communications. Bruce is the QSL manager for Ed while he is in North Korea. Unfortunately the North Korean government recently told Ed to pack up all of his ham gear and take it out of the country — not to return. Ed hopes to operate again on HF, and satellite, from a new rare location in the near future.

Nick Pugh K5QXJ described his experiences using sun noise to verify the performance of an S-band antenna and receiver system. Use of the sun as a signal source is easy, repeatable, allows for result comparisons, provides a way to measure incremental improvements to a system, and recognizes system degradation over time. Measurements are made with an AC voltmeter connected to the receiver's speaker output with the AGC deactivated. Using straightforward equations to compare sun to no-sun readings, the system's performance can be computed. Nick made it look easy.

Jerry Brown K5OE has done extensive testing with dual-band (23 and 13 cm) dish feed systems for AO-40 operation. Following the highly successful use of Jerry's design in front of a surplus five-foot dish on Field Day 2002, he has optimized his design for better performance. More information can be found at Jerry's Web site [http://members.aol.com/k5oe].

Jerry invited Robert Suding WØLMD to provide further information on other multi-band circular feed designs. Robert has a very interesting dish feed design that covered 70, 23, and 13 cm simultaneously. Robert encouraged those at the symposium to visit his Web site for construction details — [www.ultimatecharger.com/dish.html].

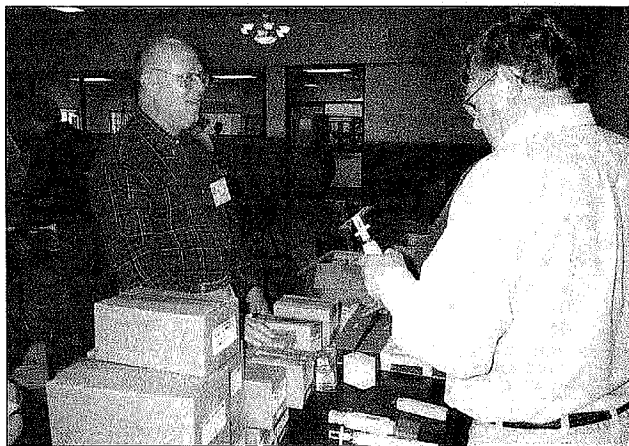


Photo C. Bob Seydler K5GNA brought plenty of "plug-and-play" 2.4 GHz gear for sale at the AMSAT meeting.

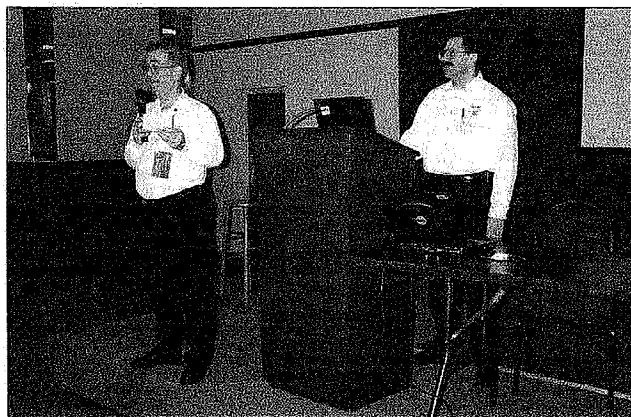


Photo D. AMSAT President Robin Haighton VE3FRH and AMSAT VP of Human Space Flight Frank Bauer KA3HDO at the AMSAT Space Symposium.

Saturday

Robin Haighton VE3FRH got things started on Saturday morning with more welcoming remarks and a financial status report. Like many volunteer organizations, AMSAT had difficulty with donations in 2002. In order to keep both Project Echo and Eagle moving forward, Robin has initiated new programs to encourage donations for these two new satellite programs.

Richard Hambly W2GPS reminded the attendees that it has been 12 years since AMSAT-NA built the microsats. There have been versions of these small hamsats built by groups in Italy, Mexico, and elsewhere. AMSAT-OSCAR-E, or just Echo, is the next small-satellite project.

Echo will be about 10 inches on a side, weigh 22 pounds, have solar cells on all sides, and of course a number of antennas on at least two sides. Details of the satellite have been presented before [<http://www.amsat.org>], but Rick provided a review of the basic capabilities. The satellite has two 12-watt, 70-cm FM transmitters with four two-meter FM receivers. An additional receiver is multiband and multimode. The satellite can be configured for simultaneous voice and data, or any combination desired.

On the digital side, data rates up to 56 kilobaud are supported with new encoding schemes, but the satellite will also run the popular 9600-baud packet format found on current digital satellites, and supported by TNCs (Terminal Node Controllers) found in many of today's advanced radios.

On the analog side, the receivers will have two CTCSS decoders to hopefully keep out some of the noise and non-ham transmissions that have plagued other FM satellites. The multiband, multimode receiver is more like a super-high-end scanner that can be programmed from the ground for almost limitless experiments including onboard voice recording.

Echo will use six Nickel-Cadmium (NiCd) batteries with 4.4 Ah capacity for a nominal eight volts. The solar panels are high-efficiency triple-junction, Gallium-Arsenide (GaAs) units running at 27 percent efficiency. They are some of the best solar cells available. Complete copies of Rick's AMSAT symposium presentations with background information can be found at [www.gpstime.com].

On a related topic, Rick continued with the topic "Microsat Design — What Do People Want?" There has always been a rift between the users and the builders. Users typically want things that they have had in the past while builders want to do something new. Fortunately for users, "new" can be advanced versions of previous successful and popular modes and bands, but there will always be a new mode or band that will keep everyone moving forward with technology. The 70-cm uplink on AO-7 was certainly a stretch for many hams in 1974. Now it's easy with off-the-shelf gear.

Stan Wood WA4NFY and other members of the Project Eagle staff presented updates on the systems to be included in Project Eagle. While the overall features are the same as the original proposals, detail work has been done on the power system, structure design, and the internal modules.

The final orbit for Eagle will be a modified GTO (Geostationary Transfer Orbit). An internal fuel tank and rocket motor will be used to raise the GTO perigee (low point) from 200 km to nearly 1,000 km. Remaining fuel will be available for adjusting the orbit for good satellite availability around the world, and also to deorbit the satellite at its end of life.

Frank Bauer KA3HDO finished the morning with an ARISS (Amateur Radio on the International Space Station) status report. Nine countries are now involved with ARISS. The current systems on the space station include low-power VHF and UHF voice and



Photo E. Doug Howard KG5OA models a tri-band circular feed system, built by Robert Suding WØLMD, during Jerry K5OE's talk on dual- and triple-band dish feed systems.

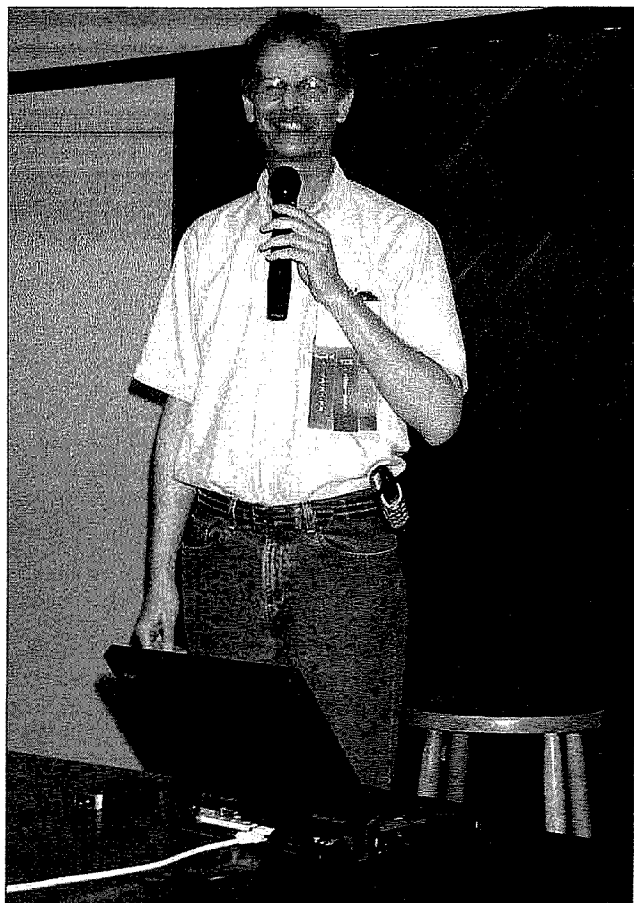


Photo F. AMSAT VP of User Services, Bruce Paige KK5DO, describes the portable AO-40 ground station that he and Jerry K5OE built for possible use in North Korea and other remote DX locations.



Photo G. Symposium Chairman and past AMSAT VP of Operations, Keith Pugh W5IU, makes a contact via AO-40 using the Lockheed Martin Amateur Radio Club station during the AMSAT Symposium.



Photo H. Howard G6LVB listens for AO-27 using an Arrow antenna and a small dual-band HT outside the main hotel for the 2002 AMSAT Space Symposium.

packet gear. SSTV (Slow Scan Television) is to be implemented soon as part of the second phase of the ham radio system. Other new items include higher-power VHF and UHF radios and HF operations. Future efforts will include FSTV (Fast Scan Television), more imaging options, improved packet systems, and equipment to be mounted on an Express Pallet unit.

Following yet another meal, Jim White WD0E and Bdale Garbee discussed the history of RUDAK (Regenerativer Umsetzter für Digital Amateurfunk Kommunikation), its German roots, and the current status of this digital communications system as configured for AO-40. The first RUDAK was onboard the now silent AMSAT-OSCAR-21. AO-40's version provides a communications link to the experiments onboard AO-40 in addition to a digital store-and-forward BBS and digital repeater. A few of the experiments that operate through RUDAK include the radiation monitor CEDEX, numerous temperature sensors, a pair of NASA GPS receivers, a pair of color CCD cameras called SCOPE, and an HF scanning receiver known as MONITOR. The RUDAK system is completely operational with only a few exceptions. It takes more uplink power than expected to use RUDAK, and some experiments like MONITOR cannot be used until the satellite is reconfigured for three-axis stabilization.

Phil Karn KA9Q followed with his proposal for an FEC-coded (forward error correction) AO-40 telemetry link. The use of this transmission format would work dramatically better than the current

uncoded system during fades, and when downlink signals are weak but without fading. While the current effective telemetry data rate is 400 bps (bits per second), using Phil's proposed format will yield a slower apparent rate of 160 bps, but the effective throughput will be much more robust under difficult conditions. While the throughput will appear to be only 40 percent that of uncoded for extremely strong reception (10 dB signal-to-noise ratio), when signals fade, the coded signals will come through with much better results (2 dB signal-to-noise ratio). If Phil's system is used on AO-40, the changes to the current user telemetry software AO40RCV would be a simple update, and it would continue to work well with the user's PC soundcard. Phil recommends that the FEC-coded format be implemented on all future AMSAT spacecraft. Open-source code for Phil's system can be found at [http://www.ka9q.net].

Jerry Brown K5OE presented the last paper of the symposium. "A K-Band Receiver for AO-40 (For Less Than a King's Ransom)." There are two fully functional transmitters on AO-40, one on 2.4 GHz (the most popular) and one on 24 GHz. While receive gear for 2.4 GHz is easily available, it's not so easy for K-band, 24 GHz reception. Even Jerry couldn't make it look easy, but he certainly removed a lot of hurdles that most hams encounter when moving up to 24 GHz.

Saturday continued with the AMSAT General Meeting and AMSAT banquet. The keynote speaker this year was Chris Imlay W3KD, the American Radio Relay League General Counsel. Chris provided insight into the political and legal circumstances surrounding the future of many commercially desirable ham bands. The

evening concluded with awards presentations and prizes. Ranging from coffee mugs to expensive radios, the drawings were great fun. The Lockheed Martin group did a fantastic job.

Sunday

Once again activities got off to an early start, this time with a Field Operations Breakfast hosted by the AMSAT VP of Field Operations, Barry Baines WD4ASW. This was soon followed by a tour of the Lockheed Martin Aeronautics Company. Security was tight, but any inconvenience (no cameras) was overshadowed by the insider's view of the place where F-16 fighters are born. Components for F-22s and the new Joint Strike Fighter (YF-35) will also be made at the facility.

For those that wished to stay after the tour, it was time for the AMSAT Board of Directors Meeting. With the exception of a short time of closed-session discussion, the Board meeting was open to AMSAT members, and was quite interesting as future projects were presented, finances analyzed and problems solved. The process lasted through Monday. A complete transcript is printed in the *AMSAT Journal* that is sent to all AMSAT members. Many of the papers presented at the AMSAT Space Symposium are printed in the proceedings, available for \$20 from AMSAT and the ARRL.

Start planning now to attend the 2003 AMSAT gathering in Toronto, Canada. Projects like AMSAT-NA's Echo, and AMSAT-DL's Phase 3-E should be well on the way to launch. Reports on other international and educational institution hamsat programs will be prominent. Don't miss it.

Doppler Fun, from Austria to Your Hometown

The Doppler Principle wasn't discovered by a ham. Its originator died two decades before Marconi was born. But when most hams think of high-tech radio direction finding (RDF), Doppler sets come to mind. This first installment of a new "Homing In" series traces the development of technologies that began with a scholar whose 200th birthday we celebrate this year.

A great deal has been written about Christian Doppler and the effect named after him, but much of it is inaccurate. Many sources even have his given name wrong, stating it as Johann Christian, or the reverse. Dr. Alec Eden, himself a pioneer in the use of the Doppler principle for medical applications, found Doppler's baptismal records at a small church in Salzburg.¹ Dr. Eden discovered that the Austrian physicist/inventor's full name was Christian Andreas Doppler.

Christian Doppler was born into a family that had built a successful stonemasonry business for 125 years, but his health was always too bad for that arduous occupation. After studying mathematics and astronomy at two institutes in Vienna, he sought a career as a professor. Despite being quite ambitious and having already published four papers in mathematics, he was turned down for several positions.

To make ends meet, Doppler spent almost two years keeping the books for a cotton cloth factory, becoming more despondent as the months went by. At one point, he sold his possessions and went to Munich to arrange a permanent move to America. He ended up not going, because shortly thereafter he was offered a position at a technical school in Prague, then part of Bohemia.

Some have claimed that Doppler ascribed his principle of motion affecting perceived frequency only to sound waves, and then others extended it to electromagnetic waves. Not so. His 1842 work was titled "On the Coloured Light of the Double Stars and Certain Other Stars in the Heavens." He gave an oral presentation to the Royal Bohemian Society of Sciences at the Patriotic Hall of Carolinum on the same topic. He theorized that light from double stars (stars

mutually orbiting each other) should display differing colors. The star rotating toward Earth at a given time should appear more blue to an earthbound observer and the one rotating away should be redder.

There was no way to measure tiny shifts in apparent color from stars in those days, so Doppler couldn't directly prove his hypothesis by experiment. Most astronomers pooch-pooched it. Six years later, Doppler set astronomy aside and took on a new scientific interest, studying the Earth's magnetic field as a teacher at the Academy of Mines in Slovakia. His publication topics included changes in Earth's magnetic declination, another subject of interest to hams who are mobile T-hunters.

Political unrest made him decide to return to Austria in 1850, and he soon was fortunate enough to be selected as the first director of the new Institute of Physics at the University of Vienna. But by November 1852, his health had deteriorated to the point that he sought relief by moving to sunny Venice, Italy, where he died four months thereafter.

If you read somewhere that Doppler went to great lengths to validate his principle, take it with a grain of salt. He was a visionary with a love of science and an inventor

of many novel optical instruments, but his grasp of mathematics wasn't first-rate. He insisted that light waves were longitudinal, like sound, instead of transverse as French physicist Augustin Jean Fresnel had correctly theorized in his landmark paper of 1821. But Doppler did successfully predict that his principle would someday provide an important method for determining the movements and distances of stars.

Trumpeters on a train

It was the director of the Dutch Royal Meteorological Institute who staged the most vivid verification of Doppler's hypothesis, on June 3, 1845.² Christoph Buys-Ballot was actually a disbeliever in the principle and thought he could disprove it by using sound waves. He enlisted help from a half-dozen

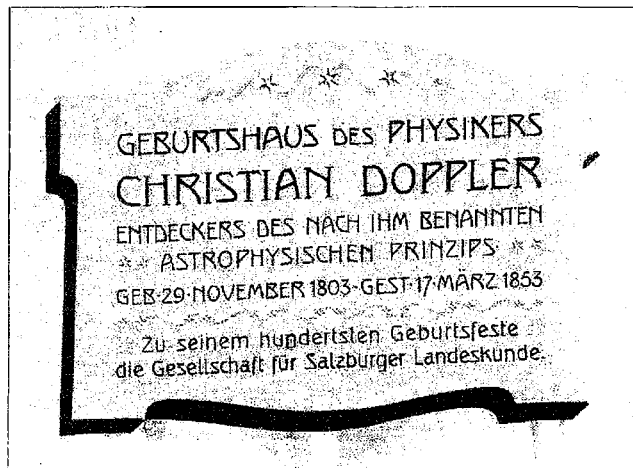


Photo A. Mozart wasn't the only famous person born in the "Sound of Music" city. This plaque on the house at Makartplatz 1 in Salzburg notes that Christian Doppler entered the world here on November 29, 1803, just across the river from Mozart's birthplace 47 years earlier. (Photo by Joe Moell KØOV)



Photo B. This Daguerreotype of Christian Doppler is thought to have been from 1845, about six years after that silver-on-copper photographic process was invented. (Public domain image)

trumpeters with perfect pitch. Half of them rode in an open Rhine Railroad train car at high speed through Maarsen station playing a G-note, where the other half of the trumpeters stood on the platform and observed the pitch.³

The experiment was repeated on the return train trip, but this time the platform musicians played and the ones on the train listened. Buys-Ballot had calculated that if Doppler was right and if the train were moving at 46 MPH, the perceived trumpet pitch would change by a half-tone (6 percent). Over the noise of the roaring train, the musicians agreed that it did. Despite this dramatic evidence, Buys-Ballot remained a skeptic.

Doppler published another paper further describing his principle in 1846, including movement of the observer as well as the source this time. He likened the stars' color shift to a boat heading out of port into incoming waves, making the wave impact rate appear faster than to an observer on shore. That part was right, but he didn't realize that

the relative motion of double stars is too small to create a noticeable color shift. They appear different from other stars simply because their lightwave spectrum is different.

French physicist Armand Hippolyte Louis Fizeau performed the first non-astronomical measurement of the speed of light with a rotating toothed wheel in 1849. He suggested that some amount of Doppler shift could be expected from all stars that are moving relative to the Earth. It was almost two decades later that English astronomer Sir William Huggins, the pioneer of spectroscopy, made instruments sensitive enough to show this to be true. As instruments improved, scientists measured the relative movements of stars and

galaxies to develop theories of how our solar system was formed and what its future will be.

The average non-ham citizen connects Doppler with just two things, speeding tickets and severe weather forecasts. A patrolman's radar set puts out a microwave signal and measures the frequency difference of the return signal that results from the vehicle moving toward or away from the radar. The greater the difference, the greater the speed.

Joe Citizen might not realize that ground-based radars tracking aircraft and boats make use of the principle, too. They display only the pips from Doppler-shifted moving targets and ignore all the non-moving reflections (clutter) from land objects such as buildings and hills. This Doppler-processing trick works especially well in airborne radars, which eliminate ground clutter on their displays by suppressing the echoes that appear to have exactly the same velocity as the aircraft.

Does this mean that a Doppler weather radar measures the speed of the clouds to tell which ones carry severe storms? Not exactly. Clouds usually move too slowly to create enough Doppler frequency shift, so the best way to determine cloud density and precipitation intensity is to simply measure the magnitude of the signals bounced back to the radar. That produces the multi-color "reflectivity" displays that you see on TV.

But Doppler weather radar has the additional ability to look at localized wind disturbances such as tornadoes and microbursts, by measuring the velocity of the raindrops, and even the blown-about insects! In the "radial velocity" mode, which is seldom shown on TV, a tornado produces a distinct Doppler "signature" of inbound winds next to outbound winds. Sometimes there is a pocket of no wind sandwiched between — that's the eye of the storm.⁴

RDF from orbit

The train-like situation of an object moving at a constant rate toward the observer, passing, and then moving away at the same rate is rarely found in VHF radio direction finding. The only example that comes to mind is the Search and Rescue Satellite Aided Tracking (SARSAT) system. Each of the USA's four SARSAT birds, in near-polar orbit at 528 miles altitude, passes over every point on Earth several times a day. Each one carries a Search and Rescue Repeater that receives and retransmits 121.5 MHz and 243 MHz signals to ground stations.

As a satellite passes over a squawking beacon transmitter,⁵ its frequency appears

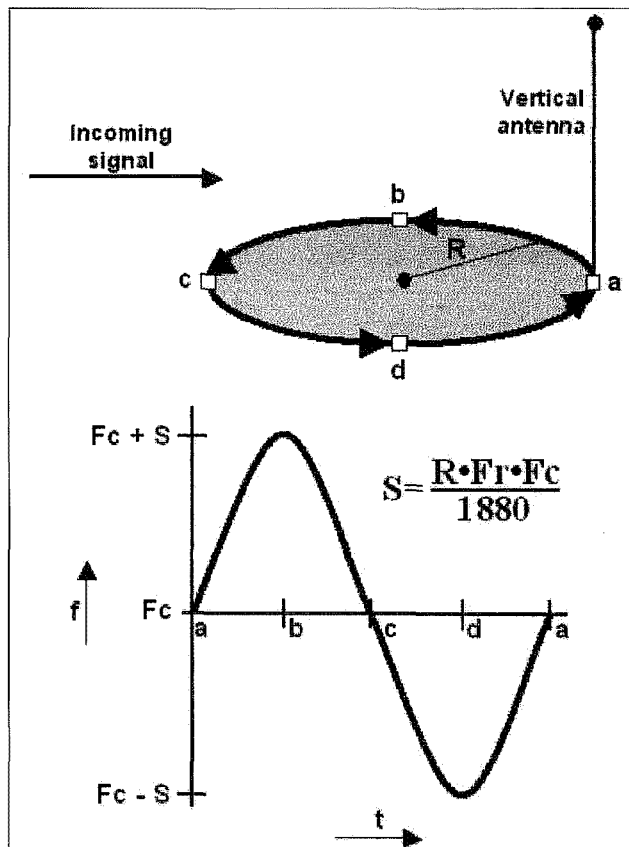


Fig. 1. Movement of a single vertical antenna in a circular track (top) makes received signals appear to vary sinusoidally in frequency (bottom), in accordance with the formula. This is simulated in ham Dopplers by sequentially switching three or more antennas spaced around the track, then filtering all harmonics from the stepped waveform induced in the receiver audio.

to shift lower at the point of closest approach (PCA). The exact amount of the frequency shift tells the perpendicular direction from the satellite's track at the PCA. The exact time of the shift gives the PCA along the track. This is sufficient data to compute position of the beacon on land with accuracy of 2 to 3 miles, or better. Multiple satellite passes refine this accuracy further. Rescue Coordination Centers communicate SARSAT fixes to local organizations such as the Civil Air Patrol.

No matter how fast we hidden transmitter hunters drive, our vehicles don't produce measurable frequency changes in the hidden T's signal. So ground-based Doppler RDF sets produce such shifts by putting a vertical receiving antenna into a very rapid circular motion. For a signal incoming from any azimuth, the antenna moves toward it, away from it, toward it, and so on. When moving toward, the apparent received frequency increases and when going away, it decreases.

The Doppler equation in Fig. 1 gives the peak frequency shift (S in Hz) as a function of signal frequency (F_c in MHz), circular rotation rate (F_r in inches), and radius of the circular track (R in Hz). Positive and negative peak frequency shifts occur at the points on the circular track where the tangential antenna velocity, relative to the incoming signal, is maximum and minimum respectively (b and d in the case of Fig. 1). From the instantaneous phase of the induced sinusoidal Doppler frequency shift, and from knowing where on the track the antenna is at that instant, we can determine the azimuth of the incoming signal.

For a practical Doppler RDF system using typical FM receivers, the circular rotation rate must be such that the recovered sinusoidal frequency shift information (the "Doppler tone") is within the audio output passband (about 150 to 2000 Hz). That corresponds to rotation rates of 9,000 to 120,000 RPM. We can't physically spin a two-meter vertical whip at that rate, but we can simulate the moving whip by putting three or more whips at equal intervals around along the track and connecting them in sequence to the receiver at an audio rate with some sort of electronic switch.

A moving antenna for Doppler-based direction finding was first published in a 1947 technical journal by British engineers C.W. Earp and R.W. Godfrey, who used a mechanically spun antenna mount. In his May 1978 *QST* article, Terrence Rogers WA4BVY described the first practical VHF Doppler RDF set for hams, employing eight whip antennas in an octagonal pattern and a PIN

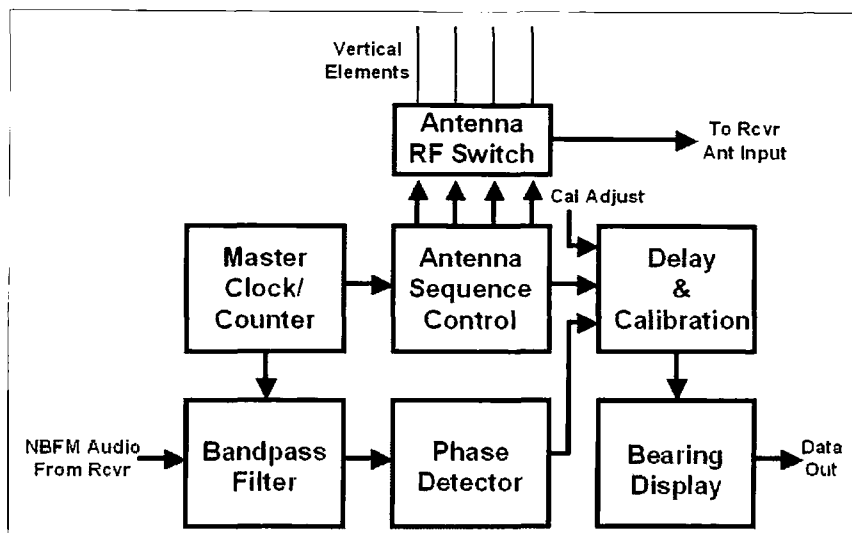


Fig. 2. A very simplified block diagram of a Doppler RDF set. Functions of the blocks have remained virtually unchanged for almost 25 years, but the components within them, using hardware or software, are adapting to new technologies.

diode RF sequencing switch to achieve an effective rotation rate of 38,000 RPM. Many improved versions followed, including the Roanoke Doppler, which was the most popular home-built Doppler project for a decade.⁶

SARSAT takes measurements over thousands of wavelengths of distance, which is why it's called a wide-aperture RDF system. On the other hand, a typical ham Doppler is narrow-aperture because its antenna system is smaller than a wavelength. Bearing accuracy suffers in a narrow-aperture system because signal reflections cause localized disruptions in the incoming

signal wavefront. The solution is to take many bearings (hundreds per second) and average them as the Doppler set moves down the road. That effectively lengthens the baseline. The averaging is done by a narrow audio filter with a passband of as little as 2 Hz. To keep the filter passband centered on the Doppler tone, the same oscillator drives both the antenna sequencing (which produces the tone) and the tone filter.

The basic Doppler RDF block diagram (Fig. 2) has changed little since 1978, but many of the functions are moving from hardware to software and firmware, reducing the

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parts count from a dozen ICs down to about five. Signal processing, analog or digital, detects potentially erroneous bearings and suppresses them. Improvements are also being made to the display of bearing information. Today's Dopplers can be part of integrated mobile RDF systems that include compasses, GPS, and computer displays, as you'll learn in later parts of this series.

How many whips?

If you go on a transmitter hunt with a bunch of Doppler fans, you'll find that most of them use four-whip antenna sets. As few as three would work, and some have as many as sixteen. No matter how many whips there are, it's important that they be placed so that they are all exactly the same distance from the center of the array circle, and they are equidistant along the circumference of that circle. Using four makes it easy to put magnetic-mount whips on a car roof, because they can be placed in a square pattern.

Is four whips the best number for a mobile setup? How is it possible to get accuracy of five degrees or better with only four whips? What does the Doppler-induced waveform from a typical 4-whip set look like, and why does it lead some hams to say that it's not a "real Doppler?" Those topics lead off the next article of this series, which delves into practical Doppler antenna sets and ways to make them work better. Meanwhile, I welcome your stories and photos of Doppler RDF installations and hunt experiences.

End notes

1. Children were usually baptized within a few hours of their birth in the early 1800s, because so many died in infancy. Based on the date and time of the entry in the records, there is no doubt that he found the right baby Doppler.

2. He had attempted it four months earlier, but had to abandon the effort because snow was blowing into the faces of the trumpeters and the cold air was detuning their instruments.

3. The pitch of the train whistle was not pure and steady enough for the experiment.

4. For more about Doppler weather radar, go to [[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/rs/rad/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/rs/rad/home.rxml)].

5. There are three types of beacons, aircraft Emergency Locator Transmitters (ELTs), shipboard Emergency Position Indicating Radio Beacons (EPIRBs), and portable Personal Locator Beacons (PLBs).

For more about SARSAT, go to [www.sarsat.noaa.gov/].

6. Complete plans in *Transmitter Hunting — Radio Direction Finding Simplified* by Moell and Curlee, published by TAB McGraw-Hill, ISBN 0-8306-2701-4. This book also has a comprehensive explanation of how a Doppler RDF set obtains bearings using the phase of the sinusoidal frequency modulation imposed on the incoming signal by the pseudo-rotating antenna. 73

How's That Thing Really Work, Anyway?

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output frequency is fed to one of the two inputs of the product detector and is mixed with the incoming signal from the IF amplifier.

That's great, you say, but 10 MHz from the IF and 10 MHz from the BFO gives me the following outputs: 10 MHz, 20 MHz, and zero. Where does the audio part come from?

Easy. Let's tune the BFO slightly "off frequency" by 500 Hz, by using a "trim capacitor" in the circuit. Trimmer capacitors could be used to bring an oscillator's output exactly on frequency, or in our case we will use it to move the output frequency "away" from the 10 MHz product. Now the output from the product detector are 10 MHz, 10.0005 MHz, 9.9995 MHz, and 500 Hz. Following the previously mentioned mixer outputs, these are the two original frequencies, the sum of the two and the difference of the two. By using the "difference" of the two, a 500 Hz output is realized in the audio range, and is usable by the audio amplifier circuit which follows.

The process of adjusting stages of a receiver to meet the mathematical requirement of the section before and after it is called *alignment*. Alignment enables the sections to perform their function, while being acceptable to the remainder of the receiver.

The 500 Hz low-level audio is connected to the audio amplifier (Block H) by using a potentiometer (variable resistor) called the volume control. It is often marked "GAIN" on the front panel of the receiver. Its function is to supply an operator-controlled portion

of the low-level audio signal produced by the product detector for amplification and a comfortable listening level. The audio amplifier section increases the audio signal to a level great enough to drive the speaker or headphones, thus enabling the operator to hear the incoming signals.

Arthur's signal was processed or acted upon mathematically by the receiver's circuits. By careful manipulation of signals and amplification of the resulting products, we can convert a signal from far above the audio range to a signal reproduced at the speaker (I) which is easily understood by human hearing.

There are other circuits that can be incorporated into a receiver to increase its performance. Some of these are audio filters, notch filters, RF amplifiers, AGC (automatic gain control), "S" meters (signal strength indicator), and more. These circuits, while not described here, are used to enhance the operation of the receiver. They are sometimes referred to as the "bells and whistles" of the receiver. 73

Breakdown in Cape Town

continued from page 32

The flight was uneventful and we arrived at Heathrow very early on the Wednesday morning, surrendered our temporary passports to the Immigration Officer, and caught the Rail-Air link home.

Despite the problems at the end of our trip, we had a fantastic time in Cape Town. With the exchange rate currently around 15 Rand to the £1, living is surprisingly inexpensive.

Special QSL cards have been printed and are available from my *Callbook* address or via the RSGB bureau. My particular thanks go to Vidi ZS1EL and Hester ZS1ESU, N4MPQ for the use of their station; to Al ZS1AAX and Kay for their hospitality and for ferrying us around; and to my XYL Jan for indulging me in a couple of very enjoyable and unexpected hours on the radio as ZS1/G3SWH. 73

Say You Saw It in 73!

Hamfest Survival Guide

continued from page 33

only others make sacrifices to satisfy our hamfesting desires, let's have a bit of a reality check and look at ourselves as well. Often I've found myself getting hold of something at a really good price (sometimes even for free), because it was the ideal part or subassembly for a future project. Then, when "later" rolled around that perfect part or subassembly turned out to be outdated or superseded by something else entirely.

What's turned out to be a better approach for me has been to buy things on an "as needed" basis: to wait until I actually need the part and buy it when the project actually calls for it. This has the added benefit that I'm actually buying parts or subassemblies that are still being made — a great benefit when someone else wants to reproduce what I build for their own use.

Also, using current parts (instead of older ones) increases the chances that we'll be able to get spare parts for "fix-it" projects later. Concerned about saving money doing this? Don't worry: There'll always be a hamfest coming up to find bargains at. As an alternative, over a decade of home-brewing has led me to find out about several different sources for brand-new parts that are reasonably priced. If you don't have these places lined up yourself, let me know; I'll E-mail you an Excel spreadsheet of the places I've found (requests can be sent to [wb9ybm@juno.com]).

Other reasons to hamfest

If spending money is a problem that you'd like to avoid, there are plenty of other reasons to attend a hamfest, like tracking down all those voices you keep hearing on the repeater and actually getting to see the face behind the voice. Hamfests make a great meeting point for socializing. Getting the chance to hand off an item previously only referred to in a discussion, or to pour over a project of mutual interest in a direct format, are two more reasons to meet at hamfests, and all it'll cost you is the admission fee. Pointing this out to our wives or girlfriends can make

hamfest attendance more socially acceptable to our families, as well. It might even provide distraction to our wives — they'll be so preoccupied commiserating about what awful ogres we are, they'll be too busy to notice the new toys we're stashing in the trunks of our cars! (The trick that must be observed here, though, to make this work is that the other ham you're meeting must also bring his wife.)

Be prepared

Regardless of the reason behind attending the hamfest, there are a few things that must be observed. The seasoned hamfest veteran will already know this, but for the benefit of the newcomers, they bear repeating. During typical outings that we get dragged to, our wives or girlfriends take care of these things, because they know we forget. But, since we are the ones dragging *them* to an outing instead, it falls to us to remember these details.

For starters, I can recommend an all-weather kit. This box should contain, as a minimum, sun tan lotion, umbrella, and other such sundries to make the Great Outdoors survivable even for the meekest couch potato, under whatever weather conditions we're likely to meet during a typical hamfest. A lawn chair, thermos, and spare change for a hot dog shouldn't be missing either.

And be prepared to have some fun! 73

Radio Comm in the French and Indian War

continued from page 35

The one display I will never forget was not in the building. K4CHE recreated a forward aircraft controller's base he had seen in Laos. Under a camouflage parachute, a makeshift stool sits in front of a table made from sandbags supporting a piece of steel runway lattice. Sitting on this table are an R-1004A/GRC-109 and an RT-778/PRC-71 from which you hear invisible ground controllers talking to their charges. The effect was that of ghosts from a war fought nearly forty years ago, calling to pilots who will never land.

For more information on MRCA, see their Web site [www.milradio.org]. For more pictures from the 2002 meet, I recommend [http://mywebpages.comcast.net/smithabl1/], which is K4CHE's Web site. 73

CQ Sooner Spring

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specific areas targeted, we contacted 11 countries, 43 states, and 29 Oklahoma cities and towns in 21 different counties. Other notable contacts during the event included eight other EOCs in Oklahoma and Arkansas, the Coast Guard, and the Salvation Army.

It occurred to us early into the exercise that picking DX out of our mini pile-ups would be difficult. We had to abandon our published frequencies to snag the DX. Our mission was also complicated by severe weather that moved across the state throughout the day. Oh, to be in Oklahoma. The equipment worked beautifully. It reached out nicely, yet was easy for the uninitiated to learn to operate and use effectively with little training. Cindy and Pete kept on task and worked the State Health Department, while Dave grabbed the coveted CDC amateur station, KK5UW (David Clark), and fellow operator KR4EA (Dr. Paul Halverson), a major goal of the event.

Sooner Spring proved to be an invaluable learning experience for everyone who participated. The capability of the Department to detect and respond to bioterrorism was significantly enhanced. The utility of amateur radio in emergency response was clearly demonstrated. And, the community is a safer place to live, work, and raise our children. As for the EOCC, it got a great christening. And, what started out to be just a good idea quickly evolved into a necessary component of the Health Department's public health emergency preparedness plan. 73

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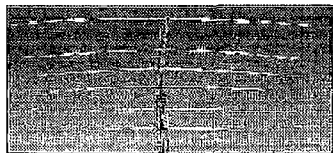
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ABOVE & BEYOND

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1/2 inch in diameter or slightly larger. The laser then will be inserted into the front of the PVC pipe section that it has the ball lens at the far end. The spacing between the laser diode and ball lens should be touching when the laser is inserted into the holder for lens and laser. The laser pointer is jam-fitted in the pipe or suspended in the PVC pipe by 4 each mounting screws spaced 90 degrees about the front and rear of the laser pointer. This last method will allow some adjustment for non-centered laser diode pointers much like adjustable spotting scope mounting rings. By slight loosening or tightening of each screw, the laser diode can be centered into the PVC pipe. Either way can work well — even the jam-fit laser.

The objective is mounted into a PVC threaded adapter bushing to accommodate the objective diameter and the focusing element inside diameter. A setscrew can hold the plastic bushing holding the objective lens in the focus mount front adjustable compartment. Then the job is to locate PVC plumbing pipe adapters to bush up the laser and ball lens to the size of the fixed portion of the focus adapter. If you can find a focuser it will make things easier to construct and adjust. The laser/ball lens assembly was inserted into a surplus focusing element bushed out by other short sections of PVC pipe to adapt the assembly to the adjustable section holding the main objective. If there is serious interest in construction-duplicating what we have done, I might be able to obtain a few more focusers from our local surplus store.

Some other alternate possibilities are broken or junk small spotting scopes — see **Photo B**. An excellent one can be constructed out of the tube and front objective lens. Just insert to fit the PVC housing the ball lens and laser and you're on the way to testing a beam expander. Sliding the PVC pipe holding the rear ball lens and laser forward and backward will demonstrate the beam expander quite well (even if handheld for an optics test bench). Try to piece together PVC adapters and pipe sections and even some threaded PVC sections that can be put together to do the same job of objective focus.

The inexpensive laser pocket pens used in this application should be of the type that uses a series resistor to limit current through the laser diode from the 2 small button batteries usually supplied. Other similar laser diode pointers use an internal capacitor that doesn't allow modulation to the laser and must be removed. All you want in the laser pen assembly is the laser diode and its limiting

resistor. Either laser will function as a driver for a beam expander — it's just that the one with a resistor to limit current can be modulated.

Several pocket laser pens were purchased from different vendors at swap meets and such to find out which pens had the series resistor between the battery and laser diode. Many other types used more complex power supply regulator schemes that make modulating the diode far too complex. It's much easier to buy several and determine which brand/vendor has the pocket laser pens using the series resistor current limiting scheme. The cheap ones are the most likely to be resistor-limited. These are very easy to modulate with our system described in the LED transceiver documentation. Most laser diode pens we purchased ran in the \$3 or slightly less category.

References and tech information

Amateur laser home page of WB9AJZ: great stuff, including our original LED communicator system articles. Construction details are available on the Web at [<http://www.qsl.net/wb9ajz/laser/laser.htm>].

Surplus ball lenses and objectives can be obtained from Surplus Shed, Blandon PA 19510. Phone 877-778-7758; or on the Web at [<http://www.surplussshed.com>] for an on-line catalog. The ball lens used is part # L1729 and costs \$4. The objective used is a 31.5 mm diameter and 80 mm focal length, part # L2076, cost = \$9 each.

Edmonds Optics has a publication on beam expanders on the Web from their tech support at [<http://www.edmundoptics.com/techsupport/DisplayArticle.cfm?articleid=270>], as well as an on-line catalog available at the .com extension.

Well, that's it for this month. Not sure what topic is in store for next month's column, but I suspect it will be test equipment-orientated. As always, for any questions concerning this month's topic or other related material, please send me an E-mail at the address of [clhough@pacbell.net], and I will answer promptly. Best 73, Chuck WB6IGP. 73

THE DIGITAL PORT

continued from page 46

Incidentally, almost all Linux software is free for the download from other sources. The attractive part of Lindows is the automated install, and that is about the only attractive appealing part that I can see.

I should stop there, but I had some other operating system failures that resulted in

using the Lindows restore disk a few times during the first week of operation. I am currently running tests to see if there are hardware problems as well. I don't think so. It would appear the problems will sort out once I get the correct operating system installed.

Off in a corner of the shack I found my older version of Red Hat Linux and installed that on the little machine. I am finding some little problems with that but I believe a Red Hat guru could sort them out. There will be some more changes, including an anticipated (soon) arrival of Mandrake Linux which I understand is about as user-friendly as Linux gets, and boy do I need something friendly <smile>.

The little Microtel machine has an 800 MHz CPU and 128M RAM with a CD drive and a floppy I installed, plus a sound chip in the motherboard, so it should become a good ham Linux guinea pig once I get it sorted out. It looks good enough on paper that I figured the worst case scenario is to install Win98se if I can't get it to cooperate any other way. The hard drive is 10 gigabytes, which is a little skimpy for the fat programs coming out of Microsoft these days, but I don't buy those anyway.

For those who are wondering, Linux is an operating system based on Unix, both of which are used in networking. Standalone desktop operation wasn't the original intent, but a lot of software has been developed that is either freeware or very cheap that, when a user-friendly system is developed can become a real contender for the high buck software that has to be continually upgraded for the Windows platform.

I don't think at this point in time that this is causing a big disturbance at Microsoft, but it could once some folks get their act together. I felt, when I first saw it, that perhaps Lindows was going the right way. Maybe they are. We as hams may be the only folks left out of their loop.

So, hopefully by next month, I will have a Linux system up and running and can extol the virtues of a different platform for your ham radio adventure.

Virus protection

There are times when I do things correctly. I have the Norton Anti-Virus software running in this computer, and a few months ago I started getting virus hits on my E-mail. The best reasoning I could give why this suddenly burst forth is my Web site where *The Chart* is posted. I am seeing the newer E-mail addresses on most of these fake mailings. Something to keep in the back of your mind if you have a Web site.

The next part of the story is when I discovered the problem that this computer

stopped talking to the modem, I needed to get to the E-mail by some other means. I chose to use the wife's computer, but that had not been used for incoming E-mail recently, so I installed the anti-virus software in that before checking the E-mail and, sure enough, two infected E-mails were scratching at the door. One good decision. It could have been a disaster.

All good things run their course

I truly hope someone corrects me on this. I received an E-mail inquiring about the fate of the ChromaPIX software. It seems the Web site is not correct. It comes up but has nothing to do with one of our favorite pieces of software. I sent an E-mail to Jim N7CX1 and it bounced as undeliverable. Tough to lose such a super package.

I stand corrected

I took a little heat about a statement I made in the December column that needs explanation and an apology. I have a way of putting words on paper that say one thing to me and can be taken another way.

The statement referred to the crummy operating system, Millennium Edition (Me) from Microsoft that so many of us had problems with. What I said was many programmers were not bothering to write ham programs for that platform. I should have added the phrase, "because Me is so bad."

Having left that off, to some folks it read that the programmers could write for that platform if they wanted to, but were simply refusing to do so for some personal inadequacy. To all who were offended, please accept my apology and I will try to improve my English presentations.

Also in the mail

I mentioned how so few receivers had a passband to take advantage of the very wide tuning pane on a program such as TrueTTY. Typically, we see about 3 kHz and that is plenty for most of us, but Jim WA9PYH dropped me a line that his Ten-Tec Jupiter will stretch out to 8 kHz. That is a bunch.

Just think how many PSK would fit, but seriously, this leads to some possibilities we don't often consider. I took a moment and brought up MixW which has a waterfall zoom and gave it a try. The maximum display width using this software is 6 kHz. With a wide passband receiver you could monitor nearly all of the popular RTTY segment continuously. Kind of a fun contest option. The downside might be the need of a steady hand for tuning. But it is a thought, and here we have it available with a USA product.

That's it for this month. We'll do it again next month. 73 and keep the digital fires lit.

73

ON THE GO

continued from page 47

1979, an electronics theory course might be interesting. The trick is to find one taught by someone who is excited about the material and knows how to pass that excitement along.

7. Teach something - That "someone who is excited about the material and knows how to pass that excitement along" I mentioned in the previous paragraph might be you. If you have a good theoretical background and a little time, perhaps you should teach that to others. Start with a short presentation at the local club meeting. The program chairman is always looking for an interesting presentation and will probably be thrilled to hear from you. If you do well and enjoy it, maybe help teach the license preparation class.

8. Plan something — In some areas, hamfests are being replaced by eBay and other on-line swapmeets and auctions. However, most of us have much more fun swapping equipment and stories (some of them true) in person. Besides, if I can see and touch a piece of equipment and take it home with me, it is much more satisfying. Help with the planning of your club's hamfest. What about setting up a special event station for your community's big event? When I lived in Ohio, the Doylestown club had a special event station for "Skunk Day" and it was great to operate. That was the first time I was ever on the right end of a pile-up! If you can have that much fun celebrating skunk day, you should have at least as much fun celebrating your community's special interest. Start planning for this now.

9. Reconfigure your station — Every time you operate, do you complain about how awkward you have the station arranged? Now's a great time to take a Saturday afternoon and rearrange the layout so it is more comfortable. In simpler times we were mainly interested in having the radio and telegraph key properly positioned. Now you may have an antenna tuner, external digital signal processor (DSP), a terminal node controller (TNC) for digital modes, etc. Locate the ones you need to adjust most frequently so they are the easiest to access. Play around with the locations and try out different configurations before you hook everything up.

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Unsettled and Unsettling

My charts and observations indicate that the sun will be very unsettled for most of February, so the propagation outlook is quite dismal once again. However, solar activity should decrease dramatically by the end of the month and remain at low levels until mid-May. In fact, my preliminary calculations for the next twelve months indicate that this is indeed the "last hurrah" for Cycle 23 and only a few brief periods of intense activity will interrupt the steady decline toward the sunspot minimum expected in early 2007.

As outlined in my August 2002 forecast, coronal hole effects often dominate the declining phase of a sunspot cycle. This became very evident a week before Thanksgiving when high speed solar winds from a large coronal hole buffeted the earth and caused a major geomagnetic storm that lasted several days. This occurred after a sudden decline in sunspot activity had many DXers expecting a bit more stability in worldwide propagation conditions. If currently plotted coronal holes return this month we can expect very high flux levels and geomagnetic disturbances from the 1st through 3rd, 10th through 12th, and 23rd through 25th. Since these intervals also fall on or near days of expected strong flare activity (marked as P or F-P on the calendar) then we might also anticipate several radio blackouts to occur.

Because the sun makes a full rotation approximately every 27 days, existing coronal holes reappear with the same frequency. I generally do not include them in my forecasts but these features often last for months and can have noticeable and predictable effects on propagation conditions. It may be worthwhile for you to track them if you prepare your own forecast or want to improve on the accuracy of my calendar. Since the Earth is most susceptible to high speed coronal outflows when holes are located near the center of the solar disc you can estimate the strength and timing of their influence by studying the 284 angstrom x-ray photographs taken by the Extreme ultraviolet Imaging Telescope (EIT) carried aboard the SOHO spacecraft. Go to [http://sohowww.nascom.nasa.gov/data/realtime/realtime-eit_284.html] for the latest series of EIT photos. Keep in mind that high speed solar winds take 2-3 days to reach our magnetosphere after a coronal hole rotates into the central third of the sun.

73 and happy DXing!

February 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
						1 P
2 P	3 F-P	4 F	5 F	6 F-P	7 P	8 F
9 F	10 F-P	11 F-P	12 P	13 F-P	14 F	15 F
16 F	17 F-P	18 F	19 F	20 F	21 F-G	22 F-G
23 P	24 P	25 F-P	26 F	27 F	28 F-G	

EASTERN UNITED STATES TO:													
GMT	00	02	04	06	08	10	12	14	16	18	20	22	
Central America	15 (40)	20 (40)	20 (40)	(40)	(40)	(20-40)	(15) 20	10-20	10 (20)	10-17	10 (20)	(10) 20	
South America	(15) 20	20 (40)	20 (40)	20 (40)	x	x	(15-20)	x	(10)	10 (15)	10 (20)	(10) 20	
Western Europe	40	40	40	40	(40)	x	(10-20)	10 (20)	(10) 20	(15-20)	(20)	(20-40)	
Southern Europe	(20-40)	(40)	x	x	x	x	(10-12)	10 (17)	(12) 17	(15-20)	20		
Africa	(40)	(40)	x	x	(20)	x	(10-20)	(10) 20	(20)	x	x	x	
Eastern Europe	(40)	(40)	x	x	x	x	(10)	(10-15)	15 (20)	20	(20)	(20)	
Middle East	(40)	(40)	x	x	x	x	(10)	(10-15)	15 (20)	20	(20)	(20)	
India/Pakistan	x	x	x	x	x	x	x	(15-20)	x	x	x	(20)	
Far East/Japan	(15) 20	20 (20)	(20)	x	x	(20)	x	x	x	x	x	(10-20)	
Southeast Asia	(15-20)	x	x	x	x	x	(10-20)	(10-15)	x	x	x	x	
Australia	(10-17)	(15-20)	x	x	(20)	(30-40)	(20-40)	(10) 20	(10-20)	x	(20)	(10-15)	
Alaska	15-17	20-30	x	x	x	20-30	20-30	15-17	15-17	x	x	15-17	
Hawaii	(10) 15	(20)	20	(20)	20 (40)	40	(20-40)	(20)	(15-20)	x	(10)	10 (15)	
Western USA	(10) 40	(15) 40	20-40	(20) 40	40	40	40	(20-40)	(10-20)	10-20	10-20	10-20	
CENTRAL UNITED STATES TO:													
Central America	(15) 20	20 (40)	(20) 40	(20) 40	(20) 40	40	(40)	(10) 20	10-20	10-15	10 (20)	15-20	
South America	(15) 20	20	20 (40)	20 (40)	(20)	x	x	x	(10)	10	10 (20)	(10) 20	
Western Europe	(40)	40	40	(40)	x	x	(20)	(15) 20	(10) 15	(15) 20	(20)	x	
Southern Europe	20	(20)	x	x	x	x	x	(10-15)	(10) 15	15 (20)	20		
Africa	x	(40)	x	x	x	x	x	(10) 20	(10-20)	x	x	x	
Eastern Europe	x	(40)	x	x	x	x	x	(10-15)	(10-15)	(20)	20	(20)	
Middle East	x	(40)	(20)	(20)	x	x	x	(10-15)	(10-15)	(20)	20	(20)	
India/Pakistan	x	(15)	x	x	x	x	(20)	x	(15)	x	x	x	
Far East/Japan	x	x	(20)	20	(20-40)	(40)	(20)	20	(15-20)	x	15	(15)	
Southeast Asia	x	x	x	x	(20)	(20)	20	(15-20)	(15)	x	(15)	x	
Australia	(10) 15	15	(15-20)	20	20 (40)	20-40	20 (40)	(20)	x	x	x	(10-15)	
Alaska	15-17	15-17	x	x	x	(40)	(40)	20	20	x	x	x	
Hawaii	(10) 15	(15-20)	20	20	(40)	(20-40)	20 (40)	x	(15)	(15)	(15)	(10) 15	
WESTERN UNITED STATES TO:													
Central America	(20-40)	40	40	40	(40)	x	(20)	(10) 20	10 (20)	10 (20)	(10) 20	(15) 20	
South America	17 (40)	(20)	x	x	x	x	x	(15)	12 (20)	10-20	10-20	12 (40)	
Western Europe	x	x	(40)	(20)	(20)	x	(20)	(10-20)	(10) 20	(20)	x	x	
Southern Europe	(20)	x	x	x	x	x	x	(10)	(15)	15 (20)	(15) 20		
Africa	x	x	x	x	x	x	x	x	x	x	x	x	
Eastern Europe	x	x	x	x	x	x	x	x	x	x	x	x	
Middle East	(20)	(40)	(20)	20	20	(20)	x	(15)	(10) 15	(10-15)	(20)	(20)	
India/Pakistan	(15-20)	x	x	x	x	x	x	(20)	x	x	x	x	
Far East/Japan	(10) 20	(15-20)	x	x	(40)	40	(40)	x	x	x	(10-20)	10-20	
Southeast Asia	(15)	(20)	x	x	x	x	x	(20)	(15) 20	(20)	(10-15)	10-15	
Australia	(10-15)	(15-20)	x	x	x	(20-40)	(20-40)	20	(15-20)	15	(10-15)	10	
Alaska	10-15	x	x	20-30	20-30	20-30	20-40	x	20	15	x	15-17	
Hawaii	(15) 20	(15) 20	20	(20)	(40)	40	(20-40)	(15) 20	15 (20)	(10-15)	10 (15)	(10) 15	
Western USA	(10) 40	(15) 40	20-40	(20) 40	40	40	(20-40)	(10-20)	10-20	10-20	10-20	10-20	

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

Band-by-Band Forecast

10-12 meters

Fair worldwide DXing can be found during daylight hours. Openings will begin to widen with the approach of Spring but windows to each region will still be limited to one or two hours. The Caribbean and Central America will provide the most reliable openings, but east-coasters should have some luck in Eastern Europe and Russia while west-coasters will do better in the Southwest Pacific. Mid-Westerners are likely to have the best luck finding "exotic" contacts in Central or West Africa. Daytime short-skip will range from 1,000 to approximately 2,000 miles.

15-17 meters

These bands should be excellent for worldwide DXing from sunrise through mid-evening. Operators located in the western U.S. will have trouble with Eastern Europe and the Mediterranean, but everyone else should find most of the world at their fingertips on Good (G) days. Asia and the Far East will be the most difficult to reach but gray-line propagation may provide a viable solution. Short-skip will average from 1,000 to 2,200 miles.

20 meters

Look for good all-night openings on "twenty" when fluxes are above 150. Peaks will also occur just after sunrise, during the late afternoon, and again in the early evening. Europe and Africa will remain open during most daylight hours while the Caribbean and the Americas should be workable at all hours except during sunrise. The South Pacific and Australia should present fairly easy pickings but Asia and the Orient are a different story. Try the hour after sunrise and the hour before sunset for weak opportunities there. Short-skip can be as little as 500 miles during the day but over 2,000 miles at night.

30-40 meters

Fair to good opportunities can be found on these bands but geographic opportunities will be limited. As usual, Central and South America will be the most promising areas, but paths to Europe, the Middle East, and the South Pacific are also worth checking. Skip distances will be 750 to 2,000 miles at night but under 1,000 miles during the day.

80-160 meters

Some worldwide DXing will be available from sunset through sunrise. Easterners can

find the best opportunities in Europe and North Africa from early evening to midnight. Midwestern operators should find the Caribbean, Central America, and South America available all night, while DXers situated west of the Rockies will find decent paths to the Americas, the South Pacific, and the Far East. Expect skip to range from 1,000 to 2,000 miles at night. 73

ON THE GO

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10. Get on the air — Winter's longer periods of darkness mean better operating conditions for twenty meters and below. We still are enjoying good propagation, and winter keeps us relatively free of static crashes caused by lightning. Try a mode that you are set up to use but haven't operated in for a while. Have FM and an antenna that can tune ten meters? Try some quick contacts through ten-meter repeaters. When was the last time you operated CW? Why not dust off the key, give yourself a little practice and find a slow station calling CQ? Morse code was once the great stumbling block for many prospective hams. With that onus gone, let's see if we can just have some fun with it as a great mode.

Winter is truly a great time for the ham operator, with so many things to do. Before you know it, spring will raise its head and the XYL will have you out in the yard with a list of chores a mile long. While winter's here, let's take advantage of it. So finish the magazine, pour a fresh cup of coffee, and head for the shack. And for goodness' sake — have fun! 73

NEVER SAY DIE

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donation would be put to a productive use.

The begging bowl banging this time has to do with our possible frequency losses at the upcoming International Telecommunications Union conference. This is not a new situation. Nor is the funding for the protection of our frequencies anything new. Seems to me I remember something about a League president who ran through around \$50,000 of the protection fund vacationing with a girlfriend in the Caribbean. Let's lift the carpet and see what's under it.

And what is the benefit to us members of the League flying directors over to Geneva to attend lavish parties at the

members' expense? Oh yes, and even paying for any lost salaries?

Yes, of course the League could help to protect our bands by doing some lobbying, but as far as I know, which is pretty far, they've never bothered to do that. I've been recommending this approach for the last ... um ... 43 years.

Not that this was my original idea. I went to the trouble to go to Geneva and visit the Secretary General of the ITU, who at the time was an American ham. I asked him what he thought our best bet would be to hold on to our bands. He pointed out what a bad taste several of our DXpeditions had left when they operated from the smaller countries and ignored their rules on power limitations and third party traffic. He suggested we send ham ambassadors to visit the smaller country officials to point out the benefits to their country of supporting and promoting amateur radio.

After returning home I talked with the League General Manager about this. He cursed, saying that he didn't need any fxxx-ing advice or fxxx-ing help in running amateur radio ... and hung up.

If you do decide to donate and get a pin or coffee mug, at least try to get the League to provide you with an accounting of how they've spent the Defense Fund. Heh, heh ... good luck.

The time to start defending our frequencies is right now with a team of ambassadors visiting third world government officials, rather than waiting for the delegates to the ITU conference, who will be arriving with orders in hand from their governments on how to vote.

Poisoning Our Children

Our beloved government is at it again. Big surprise. Until I read a piece in *Forbes* I wasn't aware that the government has been providing school breakfasts for needy children.

The fuss was over the demands of do-gooders, led by Rep. Lynn Woolsey (D-Calif.), to provide all schoolchildren with breakfasts. The idea is not to make the needy children feel stigmatized. It wasn't until I went off to summer choir camp that I was exposed to food like that. My mother never fed me any cold cereal, nor any white bread, jam, or jelly. No peanut butter and jelly sandwiches. I got hot cereal, without any sugar, and eggs fixed dozens of ways. No Danish. Instead I had fresh oranges, bananas, and melons.

These days I mainly stick to fresh fruit for breakfast. I still love hot cereal, though I know that cooked food is much

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NEVER SAY DIE

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more difficult to digest and is far less nourishing than raw.

Let's see what you can do to get your Senator or Congressman to put an end to this government poisoning of kids. It's bad enough they're doing it to us with fluorides in our water and mandatory inoculations. This is supposed to be the land of the free, so how can we get those government boots off our necks?

The First Answering Machine

John Williams W2BFD, the father of ham teletype, ran a radio repair business out of a small shop in Woodside, Queens, New York. I don't think he spent much of his time fixing radios—he was too busy inventing. He not only designed all of the first ham teletype circuits, he built one of the first ham repeaters (which I helped him set up on top of the New York Municipal Building), and he had what I'm sure was the first telephone answering machine.

It was a Rube Goldberg system, using a 78 rpm automatic record player to provide the answering message. This was in 1948, before inexpensive tape recorders. He used a Webcor wire recorder to record the incoming messages, with the whole system mounted in a six-foot 19" relay rack. Ma Bell was furious about it.

In those days Ma Bell ruled supreme and she didn't allow anyone to connect anything to one of her lines you were renting. Ma's detectives tried everything they could think of to get into John's store and confiscate the offending equipment. But John was wily. He used a carrier-current radio system to his home, a mile away, which provided him with an alarm when anyone messed with the door to the store.

At the time I was working as the chief cameraman at WPIX, the *Daily News* station. I had my 2m station set up on the top floor of the *News* skyscraper, complete with a 16-element Bill Hoisington W2BAV beam. Bill, who had his station on a fire tower up in Westchester, had a legendary 2m signal. Hmm, I'll have to write about Bill one of these days — he was another fascinating ham, and an inventor.

But what was that strange beedle-de-beedle signal up at the high end of the band? Someone said it was ham teletype and I should get in touch with W2BFD for information. Which, of course, I did.

John got so interested in ham teletype that he arranged to be an official outlet for used teletype equipment, which before that had always been destroyed when taken out of service. This was at the time that their old 1920s workhorse

Model 12 machines were being replaced by Model 19s. I got a machine from John and built a copy of his RTTY converter. This had about 20 tubes (6SN7GTs) and had control circuits so it could be turned on and off by incoming signals. This was my introduction to digital electronics and, little could I know, a major turning point in my life.

John was an electronic wizard, but he wasn't a marketer. He had little interest in promoting ham teletype; he just wanted to experiment and design new circuits. I remember one day when an FBI agent visited me, asking what I knew about John. I wasn't very helpful. Later, John said the visit probably was triggered by his building and installing a hidden microphone and transmitter in the Israeli embassy limo so Arab agents could follow the car and listen to the conversations. John wasn't politically motivated; it was fun for him to design and build the bugging system.

I tried and tried to get John to do a ham teletype newsletter, but he wasn't into writing and publishing. If he couldn't turn it out on his teletype machine, the hell with it. So, when I got a job as a TV producer-director at WXEL in Cleveland in 1951 and found they had a mimeograph machine, the first issue of a *Teletype Bulletin* went to "press." And that was my entry into the publishing world. I loved it.

John died in 1960, just as I was starting 73. Alas, he smoked (a lot), and this robbed us of around 50 years of his wizardry.

Today, thanks to the Code-A-Phone law suit against Bell, we can connect anything we want to our phone lines. We're allowed to own our own telephones. Today most of us have answering machines, but 50 years ago there was just about one of those in the world—out in Woodside, Queens.

Oh, yes. For any of you who are too young to know about Rube Goldberg, he was a famous cartoonist a generation back. Ask your grandfather about Rube's cartoons. Rube was a good friend of mine. I was the cameraman on his show and we often went out for a late dinner together after the show at the local \$1.29 steak dinner restaurant. This was back before videotape had been invented, so those programs are forever lost.

Videotape. If Gore can claim fame for inventing the Internet, I can claim without exaggerating as much for helping Ampex engineers develop their first successful videotaping system.

I got together at a television conference over coffee with the Ampex engineers who were working on the project and described the work John Williams and I had been doing with filters for ham

teletype developments as a way to get a wider band signal on their tape. Sure enough, a few months later they demonstrated a videotaping system using this approach.

The British Are Coming!

A new tax law has been estimated by the British government to drive over 66,000 small business out of their country. The new tax rate will be 74.5%, for small companies, but not for lawyers (naturally). Many of the more enterprising Brits are understandably packing up and heading this way.

Golly, that immigration is about what we're getting every three days from Mexico, but the quality is higher. We need all the small business people we can get these days — especially in information technology, engineering, aerospace, and other high tech services.

And just to make sure that the Internet-involved leave the country, the Brits have implemented a Removal of Privacy Bill 2000 (RIP), which requires that all E-mail and Web traffic be routed to government agents for monitoring. Service providers are required to install a box on their network for this. An encrypted file can get you two to five years in prison.

This will help drive international companies out of Britain, since they sure don't want the government snooping on their E-mail with their other divisions.

Where can small businessmen go? The US provides cheaper gas, food, housing, and computer equipment. The British are coming, but this time they are refugees.

(Thanks to Jim Kocsis WA9PYH for a clipping from *Electronic Design*.)

Reinventing Government

Communism, despite the convictions of many supposedly great minds, hasn't panned out. It's failed everywhere it's been tried. The old Soviet Union is a mess. North Korea is a mess. Cuba is a mess. And only the power of newly unleashed capitalism in China has saved that country from the same fate. It failed in every one of the Soviet-controlled Eastern European countries. I've visited China, Russia, the Ukraine, Poland, Czechoslovakia, Yugoslavia, and North Korea, so I've seen communism up close, not just from the newspapers or textbooks.

Socialism, as well, has failed in every country where it's been tried. I've been there, too.

Government control of business has been a failure. As Michael Medved said,

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Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$10 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively - once you know the ropes. Enjoy Sheny and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scums around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 100 Editorial Essays: \$5 (#72)

1997 157 Editorial Essays: \$8 (#74)

1998 192 Editorial Essays: \$10 (#75)

1999 165 Editorial Essays: \$8 (#76)

2000 101 Editorial Essays: \$5 (#77)

2001 104 Editorial Essays: \$5 (#78)

Silver Wire: With two 5-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. \$15 (#80)

Colloid Reprint. April 97 article on a silver colloid maker, history, and how to use the stuff. \$5 (#98)

Colloid Clips. Three 9V battery clips, 2 alligator clips & instructions. \$5 (#99)

AC-powered Colloid Kit: 12V power supply, silver wires, reprint, including priority mail shipment. \$37 (#82)

Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry; Schools in 2020: another \$ trillion industry; Anthrax, a simple cure. Dowsing: why and how it works. \$3 (#86) My 1992 *We The People Declare War!* On Our Lousy Government book - 360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need: **NASA Mooned America:** René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax - a capping blow for René's skeptics. \$25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was \$7. I found a few in the warehouse. \$3, while they last. Great book! (#83)

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Allow 4 weeks for delivery except foreign, though we try to get most orders shipped in a day or two.

Your e-mail address _____

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost) — comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the April 2003 classified ad section is February 10, 2003.

220 MHz Award; see W9CYT on WWW.QRZ.COM for information. BNB645

K8CX HAM GALLERY [<http://hamgallery.com>]. BNB620

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. \$12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [<http://wltf.com>]. BNB113

New miniature oscillator modules are now available ... all under \$20 ... plus our great reference book is still for sale. Write to **RMT Engineering**, 6863 Buffham Road, Seville OH 44273 or see our Web site at [www.ohio.net/~rtormet/index.html]. BNB640

RF TRANSISTORS TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, etc. **WESTGATE**, 1-800-213-4563. BNB6000

METHOD TO LEARN MORSE CODE FAST AND WITHOUT HANGUPS Johan N3RF. Send \$1.00 & SASE. **SVANHOLM RESEARCH LABORATORIES**, P.O. Box 81, Washington DC 20044 USA. BNB421

Cash for Collins: Buy any Collins Equipment. **Leo KJ6HI**. Tel./FAX (310) 670-6969. [radioleo@earthlink.net]. BNB425

Browse our Web site and check out the "Monthly Special." TDL Technology, Inc. [www.zianet.com/tld]. BNB500

MAHLON LOOMIS, INVENTOR OF RADIO, by Thomas Appleby (copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send \$25.00 donation with \$5.00 for S&H. BNB420

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Electricity, Magnetism, Gravity, The Big Bang. New explanation of basic forces of nature in this 91-page book covering early scientific theories and exploring latest controversial conclusions on their relationship to a unified field theory. To order, send check or money order for \$16.95 to: **American Science Innovations**, P.O. Box 155, Clarington OH 43915. Web site for other products [http://www.asi_2000.com]. BNB100

COLLOIDAL SILVER GENERATOR! Why buy a "box of batteries" for hundreds of dollars? Current regulated, AC powered, fully assembled with #12 AWG silver electrodes, \$74.50. Same, but DC powered, \$54.50. Add \$2.50 shipping. **Thomas Miller**, 216 East 10th St., Ashland OH 44805. Web address [www.bioelectrifier.com]. BNB342

ANTENNA SCIENCE: Why do antennas radiate electromagnetic waves? Learn for yourself from this enlightening paper by **MAX RESEARCH**. Gain an understanding of the radiation mechanism of antennas! Written in a clear style for radio hobbyists, inquisitive amateurs and experimenters. \$4.95 ... ppd. Order from **MAX RESEARCH**, P.O. Box 1306, East Northport NY 11731. BNB426

WANTED: ANY MODEL Collins, working or not, including speakers, filters, options, 1-piece or collection. **Bob**, 651-354-5345 days: 651-345-3600 eves. E-Mail: rkemp@mr.net. BNB661

FREE!! HAM Radio and other CD-Roms and Disk catalog. **MOM 'N' POP'S SOFTWARE**, P.O. Box 15003-TH, Springhill, FL 34604-0111, 1-352-688-9108, visit: <http://www.momnopsware.com> BNB660

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NEUER SAY DIE

continued from page 62

"The government makes a mess of everything it does." Amen.

Our public school system is a beautiful example of a government-run mess.

Okay, Wayne, so what do you suggest? Gee, I thought you'd never ask.

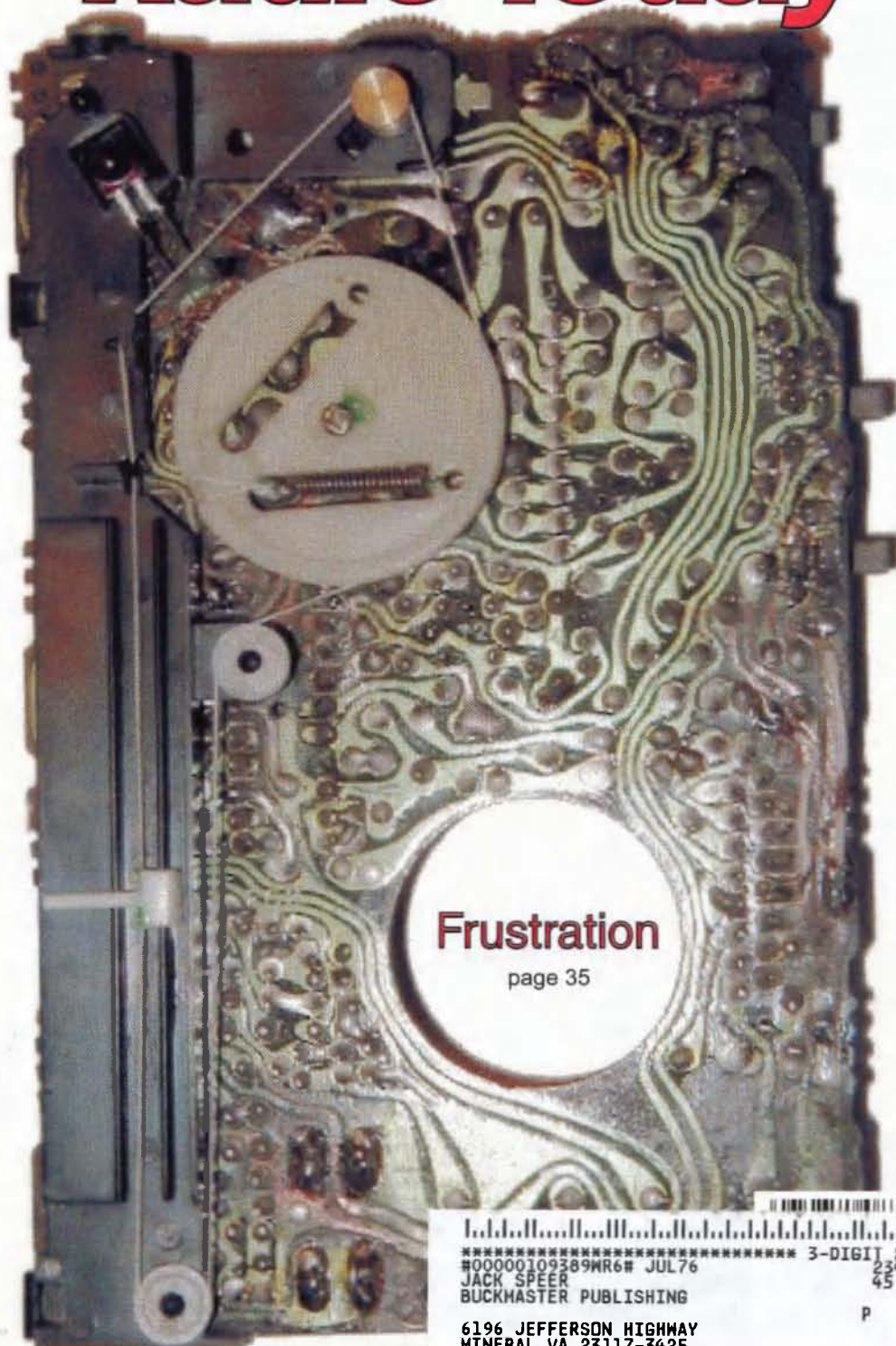
With communism a failure, ditto socialism and fascism, the one shining star is capitalism. Yes, we have some problems with capitalism. It's a great system as long as businesses don't get too big. Unfortunately, as they get big they start tilting the playing field. In their direction. They tend to use their political power to eliminate competition, rather than let the marketplace make this decision. The big get bigger and bigger, gobbling up the smaller companies, such as Time-Warner and Digital Equipment.

Government Run as a Business

Let's see how you like this concept. Let's consider setting up the federal government as a publicly owned corporation where we're both the customers and the shareholders. Like any corporation, it has a board of directors who manage the business. They elect the president, CEO, CFO, and so on — and they fire poor performers. We shareholders elect the board of directors.

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Frustration

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QRX . . .

Why Computers Crash

If a packet hits a pocket on a socket on a port,
And the bus is interrupted at a very last resort,
And the access of the memory makes your floppy
disk abort,
Then the socket packet pocket has an error to report.

If your cursor finds a menu item followed by a dash,

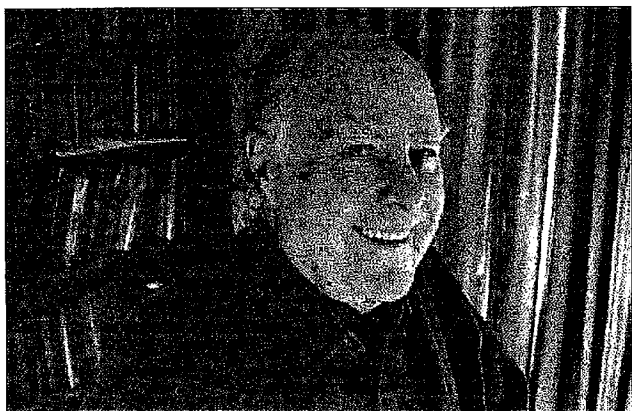
And the double-clicking icon puts your window in
the trash,
And your data is corrupted 'cause the index doesn't
hash,
Then your situation's hopeless and your system's
gonna crash!

If the label on the cable on the table at your house,

Continued on page 6

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article (IBM (ok) or Mac (preferred) formats), carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

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Wise Up & Beat the Odds

NEUER SAY DIE

Wayne Green W2NSD/1

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www.waynengreen.com

X Again

Have you got your QRP gear in good shape yet? How about emergency power for it? Well, hold tight...I may have more news on Planet X next month.

I've been talking with the experts ... trying to find out who's real and who's bogus when it comes to Planet X. Like Nancy Lieder [www.zetatalk.com], who's been on the talk shows giving us a May 15th date for a pole shift. Now I'm hearing that she may just be a shill for NASA and the sneaky plan is for May 15th to go by with nothing happening...thus blowing up all the Planet X stuff as baloney. Whew! Darn, just when I thought the world as we know it was about to end.

Could Nostradamus, Scallion and the other doomsayers have it wrong?

Nancy's story, that she got her info about Planet X psychically from the Zeta Reticulus does not inspire my confidence. But, on the other hand, I see the events predicted by Mark Hazelwood in *Blindsided* And Jim McCanney in *Planet-X* happening right on schedule. Like our having weird weather. Like more volcanoes and earthquakes than in recorded history. Like both Mars and Pluto heating up. Like the weirdest sun spots in history. Hey, something is going on.

You can join the fun via [www.zetatalk.com], [www.jmccanneyscience.com], and [www.planetxvideo.com].

You can get copies of the two books from Radio

Bookshop, \$15 each, items #94 (Hazelwood) and #95 (McCanney), and scare yourself into getting a good QRP rig working.

Iraq

If you are reading this before we attack Iraq, fine. Nobody has asked, but naturally I have some advice for our military commanders. My advice? Drop everything and read *Black Hawk Down* or watch the movie. Wise up and don't get our troops involved with fighting in the cities. Learn from the mess you got into in Somalia.

The alternative? Go back a few hundred years when castles were being attacked. The dumb (military) way was to throw big stones with catapults, use battering rams, ladders to get over the walls, and so on. This killed a lot of the invading army, which probably wasn't a bad thing. The more economical way was to surround the castle and wait for the people inside to run out of food.

Then there's the Genghis Khan approach. When he and his horde started on their campaign they came to the first village on the road and gave them an ultimatum: surrender or be killed. The village fought back. And lost. The invaders proceeded to level the village totally, killing every living thing in it. Men, women, children, and even the chickens.

From then on they never had another problem with villages and towns.

No, I'm not suggesting we

obliterate an Iraqi village as a demo. When our armies come to a city I suggest they circle it and wait for the food to run out. It won't take long before the inhabitants get hungry and will begin to be interested in an alternative to street by street fighting. Let's see videos of long lines of Iraqis surrendering their guns and then sitting around having their first good meal in weeks with our army as hosts. No, let's not be mean and serve them pork pies.

The Iraqis obviously learned from our super botched Somalia. If you watched the segment on "50 Minutes" you saw men, women and children all being given guns and ammunition in Baghdad so that every one of 'em could take out as many Americans as they could. And I'll bet this is happening in every city, town and village in the country.

But, what about a few die-hard snipers who stay in the village, waiting for our soldiers to come into the evacuated town? Hmm, we could be sure the villagers are kept upwind and fumigate the place with poison gas. Or we could, at the first shot, level the town à la Khan, and move on, leaving the villagers to start rebuilding.

But no one asked.

Silver Canteens

During WWI the German soldiers used silver canteens. This allowed them to drink the local water as they moved around without getting dysentery,

an illness that debilitated many of the Allied troops.

The ability of silver to kill germs was known long before doctors stopped denying that there was such a thing as germs. A silver dollar was put into milk to keep it from spoiling. Of course, that was back when silver dollars were actually made of silver. And guess what the wealthier people ate with? Silverware. The hoi polloi ate with their hands ... and got sick.

I've been doing a very brisk business selling silver colloid kits. They're item #82 from Radio Bookshop, and consist of an AC power supply, two #10 pure silver wires, instructions, a reprint of an article on making silver colloid, and priority mail shipping ... all for \$37.

If any of this bioterrorism materializes, this stuff could help.

Meanwhile, I've been hearing from a lot of people who have been downing a few teaspoons of 10 ppm every day without turning gray, and reporting no more colds or flu.

Immigrants

I don't care where anyone or their parent (or grandparents) came from ... they came to American because it offered a better life than their home country did. What I wish to hell all of 'em would do is accept our language, speak it, accept our culture ... and live it.

I don't want to hear any

Continued on page 8

continued from page 1

Says the network is connected to the button on your mouse,

But your packets want to tunnel to another protocol,

That's repeatedly rejected by the printer down the hall,

And your screen is all distorted by the side effects of gauss,

So your icons in the window are as wavy as a souse,

Then you may as well reboot and go out with a bang,

'Cause sure as I'm a poet, the sucker's gonna hang!

Thus when the copy of your floppy's getting sloppy in the disk,

And the macro code instructions cause unnecessary risk,

Then you'll have to flash the memory and you'll want to RAM your ROM,

Then quickly turn off the computer — and be sure to tell your mom!

Thanks to unknown author, from the Internet, Dec. 2002.

Down Under Update

The Wireless Institute of Australia has recently updated its Web site. All those who wish to apply for Wireless Institute of Australia awards certificates should immediately check out their new Web site data at [<http://www.wia.org.au>], and use the following address: Malcolm K. Johnson VK6LC, Wireless Institute of Australia, Federal Awards Manager, P.O. Box 196, Cannington 6987, Western Australia, Australia; [awards@wia.org.au].

Thanks to VK6LC.

Element Two Technician Question Pool Revised

The FCC question pool for Element 2, the Technician written exam, has been revised. The new 511-item pool will take effect on July 1, 2003. The older pool contains 385 items. The new question pool can be viewed via [www.arrl.org/arrlvec/pools.html].

Thanks to Balanced Modulator, Jan.-Feb. 2003.

Here's Lookin' at the REAL Ya!

In more news from Venus, we've learned that our source for last month's item on the canals had ITS source wrong, so we hasten to credit Bob Gonsett and his *CGC Communicator* for that eye-opener.

Dog Days of Winter

An inter-species communications apparatus — as in a dog-to-person translator — was one of the winners of the 2002 Ig Noble awards.

What are the Ig Noble awards, you ask? They are a spoof of the famed Nobel Awards ceremony and are given annually at Harvard University to recognize achievements that cannot or should not ever be reproduced.

Winners are selected by a secret committee from thousands of nominations. Actual Nobel laureates present the Ig Nobles at a ceremony where the winners are hailed with cheers and a flurry of paper airplanes. And if a recipient feels insulted or slighted by the award, it is withdrawn.

For 2002, those victorious included the people behind the definitive study on belly-button lint, and an inquiry into what arouses ostriches. But by far the dog-to-person translator was one of the most popular. It works by listening to the tone of a dog's bark, converting that data into an interpretation of the dog's mood.

The device is already on the market in Japan. An English language version called Bow-Wow-Lingual — nope, we are not kidding — Bow-Wow-Lingual — may be on the market here in the USA in about a year. And we thought that you'd want to know.

For more about the Ig Noble awards, see [www.improb.com/ig/ig-top.html].

Thanks to Science Frontiers, via Newsline, Bill Pasternak, editor, with special mention to his dog, Daisy.

Beam Me Up

As incredible as it may seem, a Star Trek-like transporter may be a step closer to reality. This, after physicists in Denmark make two samples of trillions of atoms interact at some distance.

The experiment involved a science called quantum entanglement. This is a mysterious theory of a controlled spiraling of two or more particles without any physical contact. Scientists say that these entangled states are needed for quantum computing and for teleportation.

Before the team at the University of Aarhus made its breakthrough, other scientists had successfully developed entangled states of a few atoms. But the scientists in Denmark have now done it with very large numbers.

At the moment, nobody is about to teleport anyone, anywhere. But the research, which was reported in the science magazine *Nature*, makes the idea of instantly transporting an object from one place to another less far-fetched.

If all goes well, maybe the term "Beam me up, Scotty" will be reality in our great, great, great grandchildren's lifetime. The only question is whether a 5 word-per-minute Code test will still be required to "communicate" using that rather exotic mode.

Thanks to Future Technology, via Newsline, Bill Pasternak WA6ITF, editor.

Zero Gravity

When NASA first started sending up astronauts, they quickly discovered that ballpoint pens would not work in zero gravity. To combat this problem, NASA scientists spent a decade and \$12 billion developing a pen that writes in zero gravity, upside down, underwater, on almost any surface, including glass, and at temperatures ranging from below freezing to over 300 degrees C.

The Russians used a pencil.

Thanks to The Tuned Circuit, November 2002.

Dumb Newspaper Headlines

- Include Your Children When Baking Cookies
- Something Went Wrong in Jet Crash, Experts Say
- Police Begin Campaign to Run Down Jay-walkers
- Drunks Get Nine Months in Violin Case
- Iraqi Head Seeks Arms
- Is There a Ring of Debris Around Uranus?
- Prostitutes Appeal to Pope
- Panda Mating Fails; Veterinarian Takes Over
- British Left Waffles on Falkland Islands
- Teacher Strikes Idle Kids
- Clinton Wins Budget; More Lies Ahead
- Plane Too Close to Ground, Crash Probe Told
- Miners Refuse to Work After Death
- Juvenile Court to Try Shooting Defendant
- Stolen Painting Found by Tree
- Two Sisters Reunited After 18 Years in Checkout Counter
- War Dims Hope for Peace
- If Strike Isn't Settled Quickly, It May Last a While
- Couple Slain; Police Suspect Homicide
- Man Struck by Lightning Faces Battery Charge
- New Study of Obesity Looks for Larger Test Group
- Astronaut Takes Blame for Gas in Space
- Kids Make Nutritious Snacks
- Local High School Dropouts Cut in Half
- Typhoon Rips Through Cemetery; Hundreds Dead

Thanks to the "Giggle Hertz" section of Radio Flyer, the UBET ARC newsletter, April 2002.

Hot Air

Well, another would-be tallest man-made structure could soon be towering over the Australian outback. This, as part of a plan to capitalize on the global push for greater use of renewable energy.

By 2006, the Australian power company EnviroMission Ltd. hopes to build a 3,300-foot-high solar tower in southwest New South Wales state. The 200 megawatt solar generating station will cost nearly \$563 million dollars to build and will be the width of a football field.

The technology behind its operation is very simple. The sun heats air under the tower's glass roof. As the hot air rises, a powerful updraft is also created by the tower that allows air to be continually sucked through 32 turbines, which spin to generate power.

EnviroMission hopes to begin construction on the solar tower before the end of the year. It says that it plans on generating enough electricity to supply 200,000 homes around the beginning of 2006.

Currently, the world's tallest free-standing structure is the Canadian National Tower in Toronto. It's about 1,650 feet high.

Thanks to W8HDU, via Newsline, Bill Pasternak WA6ITF, editor.

W6OBB Retires

Art Bell W6OBB bid a final farewell to his "Coast-to-Coast A.M." radio show as 2002 gave way to 2003. Over the 15 years he hosted the show, Bell took it to the very top of the ratings

peak. It was on over 450 radio stations in North America and heard worldwide over the Internet, and had an audience estimated in the tens of millions.

Bell had departed the show once before due to a family situation that needed his full time and attention. The show did not do well under the substitute hosts. Bell returned the following year and rebuilt the program to its powerhouse position on the Premiere Radio Network. Often, after the program, Bell could be found on 75 meters chatting with his friends.

In saying good-bye to his listeners, W6OBB explained that this is not the end of his career in radio. Actually, it's a new beginning.

Bell says that he and his wife have made one of their dreams come true. They built their own radio station — KNYE — located in Pahrump, Nevada — and it's now on the air. Bell says that building KNYE into the station he wants it to become will be the next challenge in his broadcasting career.

Meantime, you can still hear — and talk to — Art Bell, but only if your signal can be heard in Pahrump, Nevada. Just listen on or near 3.840 MHz for the callsign W6OBB. If you hear Art, please say hello, and you might add, "Thanks for the ride..."

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Words That Don't Exist, But Should

AQUADEXTROUS (ak wa DEKS trus), adj. Possessing the ability to turn the bathtub tap on and off with your toes.

CARPERPETUATION (KAR pur pet u AY shun), n. The act, when vacuuming, of running over a string or a piece of lint at least a dozen times, reaching over and picking it up, examining it, then putting it back down to give the vacuum one more chance.

DISCONFECT (dis kon FEKT), v. To sterilize the piece of confection (lollipop) you dropped on the floor by blowing on it, assuming this will somehow "remove" all the germs.

ELBONICS (el BON icks), n. The actions of two people maneuvering for one armrest in a movie theater.

FRUST (frust), n. The small line of debris that refuses to be swept onto the dust pan and keeps backing a person across the room until he finally decides to give up and sweep it under the rug.

LACTOMANGULATION (LAK toe man gyu LAY shun), n. Manhandling the "open here" spout on a milk container so badly that one has to resort to the "illegal" side.

Continued on page 61

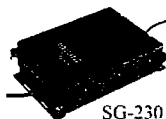
Smart Choice! Smartuner!

Do **YOU** want to be heard? *OF COURSE!* Then use the SGC Smartuner™ - the *Essential* link between your **HF transceiver** and **antenna**. Matching at the transceiver is good, but matching at the antenna is better. SGC Smartuners are designed to do just that. They operate completely independently to provide the best match between the feed line and the antenna, eliminating SWR problems completely.

SGC Smartuners are designed to work with *any* transceiver (including the ICOM 802) and *any* antenna. They are fully automated, intelligent enough to select the best match between feed line and antenna in seconds and remember it so it can recall that match in milliseconds. The Smartuner sets the standard. It is the original and still the best.



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SG-230



No Compromise Communications



SG-231

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LETTERS

From the Ham Shack

Herman KN5GRK. I read "Never Say Die" in the November issue of *73 Amateur Radio Today*. Your column brings out how important a mobile emergency communications vehicle will be in time of a disaster such as the ones you mention in this article. I don't subscribe to *73* but was referred to your article by a fellow ham who realized it had a bearing on our club project.

Our club purchased a 1987 Chevrolet step van, and we are currently getting it ready to make a "mobile operations center" — some of the reasons we feel we need this van are mentioned in your article. We are in the process of obtaining letters of recommendation from local emergency agencies, police, sheriff, fire, mayors, school board, etc., in order to obtain a federal grant from the FDA to purchase the equipment to be used in this project.

I would also like to have your permission to use this article or portions of your article in our next newsletter and as a reference to some of these agencies to get our point across. Credit will be given to you and *73* magazine.

I see that you would like to have a report and pictures of these emergency mobile communications vehicles. I have added a photo gallery on our van project with a link to "Scope of Project" that explains what we plan to do with our van. We have a long road to travel, but I think the waiting and work will pay off, plus provide a lot of fun and education in amateur radio for our club.

If you would like to see our pictures, just go to: [<http://www.w5ddl.org/clubsite/vanproject.htm>].

Permission granted, for this worthy

project, OM ... but please be sure to include subscription information in the reprints, in case anybody who has been too cheap to subscribe thus far feels so inclined ... if you know what we mean. Good luck, and keep up the good work! — ed.

Tracy Markham N4LGH. I just want to say thank you, heartily, thank you, for the QRX article on Dollar Power in the Jan 2003 issue.

I understand a lot of the symbolism that Ben Franklin and Thomas Jefferson and their "gang" built into our insignias and other marks. But I never looked at the dollar, and the symbols on it, like I have since I read that article.

Thank you for finding it — I know you're not sure of the author, and perhaps it's best that way really. Again, thank you ...

Clinton Peebles VE7KNL. It's a sad fact, but there are dishonest hams out there. At least they call themselves amateur radio operators, but in my opinion they are nowhere close. I have recently had the unfortunate opportunity to deal with one. I purchased a Kenwood TMD-700A radio, serial number 30100018, from K.A. in Edmonton. It's now been 6 months and I still haven't seen the radio, nor do I expect to. Like a fool, I trusted him and sent him a money order. Never do this! C.O.D. charges are small compared to what you will lose. I know of at least one other ham who was also taken in by this thief for the same radio. Don't count on help from the R.C.M.P. — you won't get it.

There is a group on [www.yahoogroups.com] called BADHAM. If you are planning on a private purchase, it's a good idea to use this group. If you've been ripped off, please list the culprit there so others don't get ripped off by the same crook.

Ray J. Howes G4OWY. Wow, "440 home-brewed projects" ("Letters," January 2003). KC6WZK, I salute you! This man puts me to shame — and how many others, too, I wonder? And what's even better, he's a QRPer as well!

Yes, as Dain rightly implies, home-brewing ham equipment (not kits), especially transceivers, is now unfortunately a minority interest amongst hams. No doubt this is due in part to many things — commercialization of our hobby and a lack of a willingness to just get on and do it, to name just two.

Anyhow, I'm sure that anyone reading KC6WZK's letter (and seeing his station photograph) can't fail to be fired up to try to emulate, if only in part, this particular ham's obvious love of rolling your own! Here's to many more constructive years of home-brewing and QRPing, Dain!

Edwin Olsen W4GES. My most recent lipid panel results are beautiful, and this without Liptor or Zocor, or any other cholesterol-lowering drugs. I attribute this to following your dietary guidelines. Each of these drugs had had a very adverse effect on my liver. In the case of Zocor, it took months before my liver enzymes went back to normal. Thank you for your pioneering efforts in promoting good health.

NEVER SAY DIE

continued from page 4

more crap about Irish-Americans, German-Americans, African-Americans, Italian-Americans, and so on. Look, guys, you're here, and if you plan to stay get rid of that crummy hyphen and start thinking of yourselves as Americans. Accept and live our culture. Please don't continue to try to keep the "old country" culture alive here. You left that for something better.

Yes, a bunch of Americans have different skin colors. Get over it.

It's about damned time for blacks to forget Africa. I'll be glad to start

taking up a collection to pay blacks their fare to any country in Africa they'd like to move to and give them a stake to get them started there.

It won't take much of a collection because I doubt I'll have any takers. I've been to a bunch of African countries (10 so far) and there isn't one I'd want to live in. No American black would either, if they'd ever visited any of 'em.

Let's stop this destructive nonsense of school classes for non-American-speaking children. Government forms should be in American, and not in any other languages. Let's even get rid of American newspapers published in

foreign languages. America, love it or, dammit, leave it!

Foreigners coming here should accept our American heritage and forget the one they left behind. Our heritage is a combo of English, Scotch, Irish, Italian, German, Russian, Jewish, American Indian, and so on. No, I have no problem with Chinese, German, and so on restaurants. The more foreign food restaurants, the better. Well, that's as long as you insist on poisoning your body with cooked food and shortening your life. Bon appetite. Bon obesity, diabetes, and heart attacks.

Continued on page 42

Build Your DREAM Antenna

As in "Dual-suspension, Removable, Easy-to-build, Amateur-radio, Multiple-band, 10-meter mobile antenna system."

Take a couple of hours, mix in a little creativity, and you can change that boring commute to work every day into hours of glowing reports and solid contacts.

This article describes an effective, efficient, broadband, 10-meter DX mobile antenna. Now, don't let poor past experiences with mobile signals put you off — you'll be surprised at the difference a full-size quarter wave antenna makes, especially if you're used to dealing with magnetic-mount antennas. The best mobile signal reports I've ever received were from 102-inch steel whips that were cut down to the 10-meter band.

Let's quickly review some of the problems with using a short antenna. You already know they're inefficient because of their size and use of coils, not to mention the narrow SWR bandwidths. And hey, get just a little bit of dirt or grit under the magnet and you get this interesting circle of annoying scratch marks right on the top of your car. On the other hand, quarter wave antennas are efficient and broadband, and this design does not cause any damage to the car! Plus, since we'll be using a standard antenna mount, if you ever get tired of 10 meters (can't happen, by the way!), you can just swap the whip for one of the many other antennas on the market.

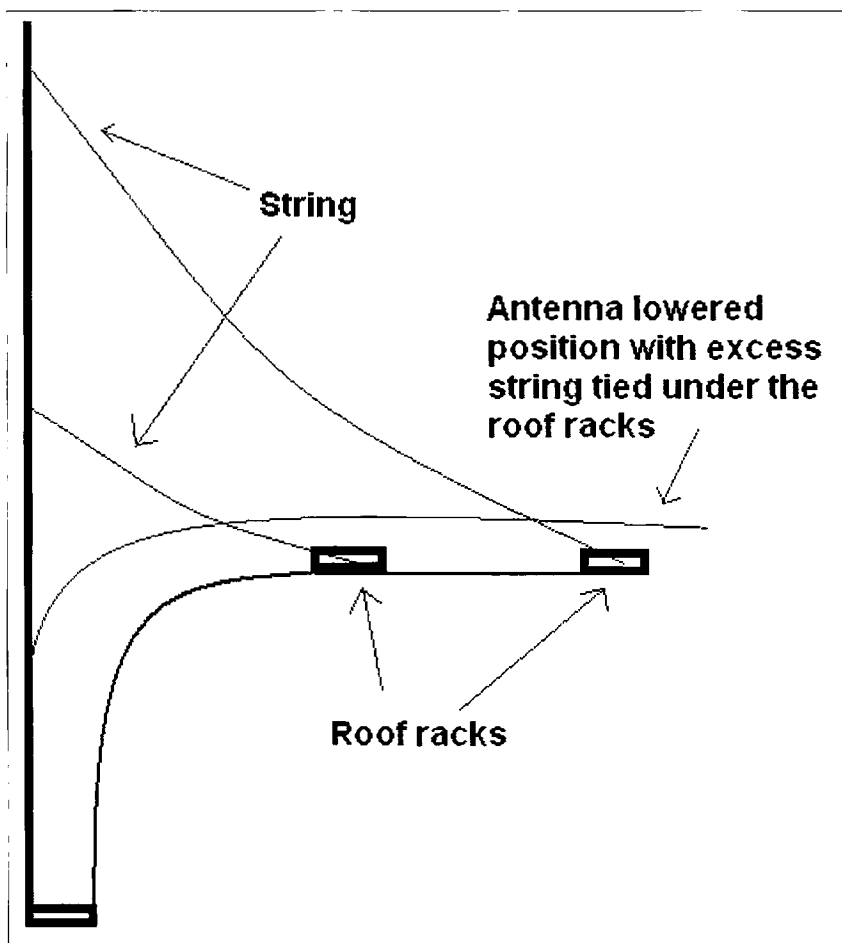


Fig. 1. Dual suspension.

Even with all these reasons to do this project, that doesn't mean there aren't any drawbacks to having an 8-foot monster antenna tacked onto the back of your vehicle. One problem to watch out for is the low-hanging trees in the neighborhood. I've whacked many a branch, so be on the lookout. And what about the fast food drive-through or even garages? Height limits are a problem there as well. Don't worry. My patented (yeah, right) design will solve these problems for you. To see how, let's start by taking a look at the promise of the article title.

Dual-suspension (Fig. 1)

Okay, so the dual suspension is just two pieces of string, but this very simple system is extremely effective. It's great for times when you are entering places with low overhead clearances. It solves these problems by allowing you to bend the top of the whip down to the roof of the car. If you are lucky enough to have a roof rack available (**Fig. 1**), one end can be tied near the top of the antenna with the other tied off to the roof rack nearest the front of the vehicle. Plus, if the roof rack is adjustable (with the ability to slide back and forth), there will probably be some sort of latch that opens. Just open the latch, pull the top string and antenna down toward the car, and wrap the excess line under it. And when you are ready to put it back up, all you have to do is just release the latch. If there is just no place to tie the top part down, you might want to try another setup I've used (**Photo A**) to at least control the sway of the antenna.

Removable

My goal was to put together an antenna system that does no damage to the vehicle at all. That way, when it comes time to buy a new vehicle, you don't have to just leave the mount on the old car and buy all new parts for your next car. It's non-invasive since no drilling (at least externally visible drilling) is needed. That way you don't have to worry about any loss in the price of the car. Even the cable and ground wires can be removed easily.

Easy-to-build

Besides the antenna whip and coax, there is only one other key component to this system. That is the antenna mount itself. It's actually a mirror mount (see the parts list), and it installs on the end of the 1/4" tubing (**Photo B**) that is used as the mounting support. Although it's easy to build (it generally just takes a few U-bolts and clamps), remember that I mentioned you'll need a little creativity? I wish I could just give one method of connecting up the antenna that would work for all cases, but if you take a quick look underneath various vehicles, you'll see that each is different and you'll need to come up with some possibilities for your particular instance. See the section on putting it all together later in the article for information and some ideas to get you started on this.

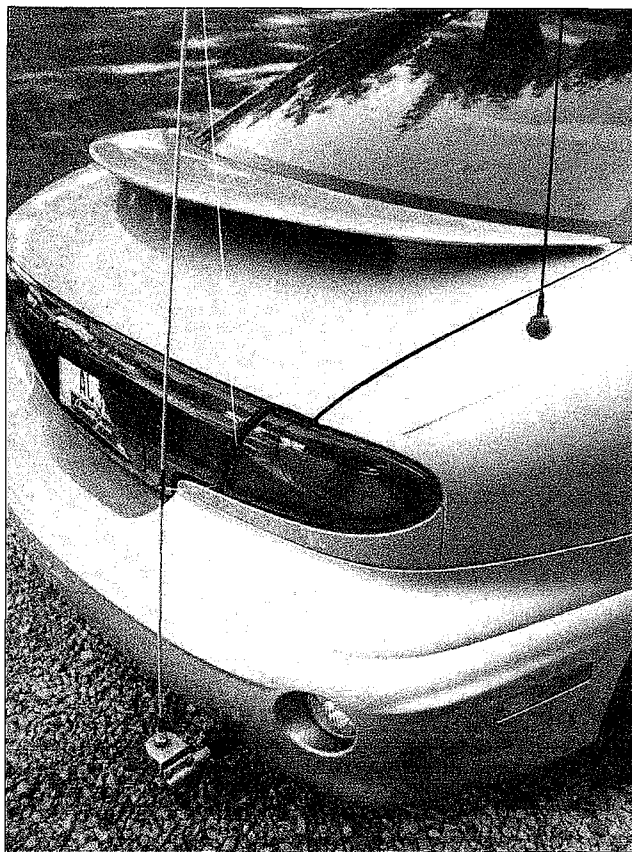


Photo A. Stabilizer tie-up.

Amateur-radio

Well ... No dah!! Or, should that be "No dit"?

Multiple-band

This one may surprise you. A quarter wave antenna is very broadbanded. In fact, after you get the entire system working perfectly on 10 meters, switch down to the 12-meter band and try a signal there. You can do this either through a

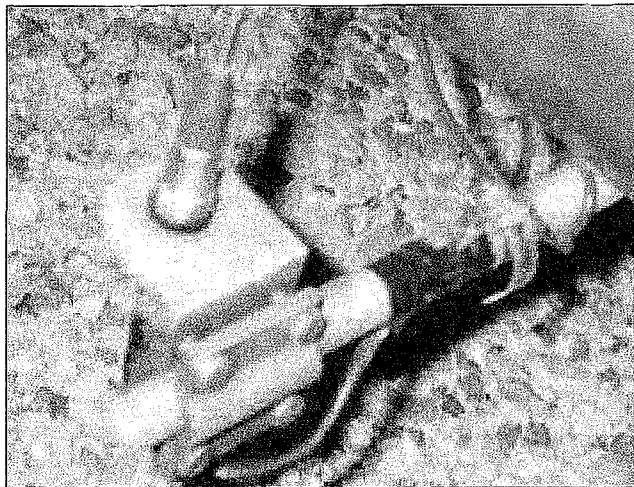


Photo B. 1/4" tubing supporting the mirror mount.

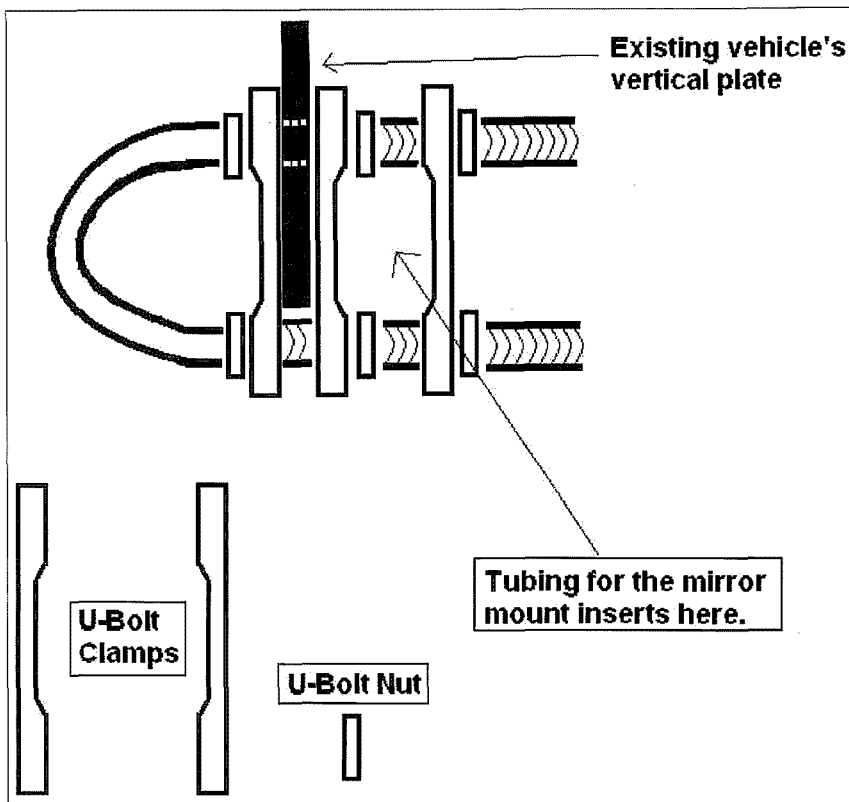


Fig. 2. Bolt and clamp assembly.

mobile antenna matcher or do what I do and just run it direct. If your radio has built in SWR protection, it will cut back the power to a safe level and you'll end up running 12 meters at low

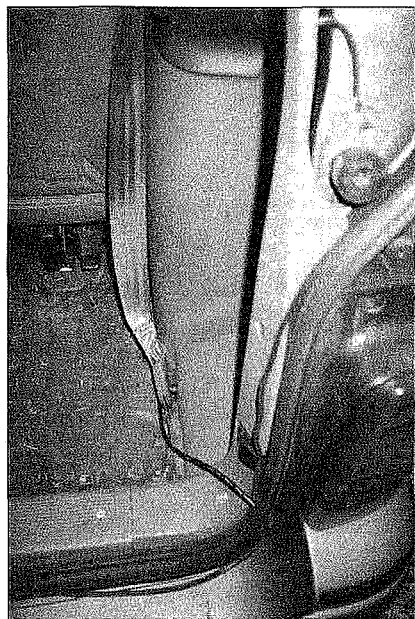


Photo C. Slip the cable into the trunk through the water seal if there are no water holes that you can use.

power. Sure it's reduced power, but hey, QRP can be a lot of fun. Plus, the band isn't crowded so it doesn't take much to get a signal through. The antenna is pretty efficient at least down to 12 meters. Beyond that, you'll spend a lot of time yelling and screaming before making any contacts.

Putting it all together

Start the whole process by crawling under the back of the vehicle to decide on a mounting design to connect the two feet or so of the 1/4" tubing to the underside of the car. The length of the tubing will depend on just how far back under the car you need to go in order to find a place to attach it. Trying to figure out how to mount the tubing is going to be the hardest part of this project. You'll need to find at least two support spots. One will just support the weight of the mount and antenna; the second keeps the whole thing from swaying back and forth. Search for holes under the car that can be used as an attachment point for the U-bolts. Look for potential spots in the frame

up above where the tubing will be positioned or perhaps even horizontal to the tubing. Another option is to look for any existing bolts in the frame that may be extending out enough to be useful. If you find one long enough you can just lay the U-bolt over it and use that as the support. The best thing to do though is to draw a quick picture of what you see under there and then take a trip to the hardware stores, auto parts stores, and even plumbing supply stores to come up with some ideas. Some things that might work for you are toggle bolts, turnbuckles, and Milford hangers.

I did come up with a way (Fig. 2) of combining a few U-bolt and clamp parts together that you'll likely be able to use one way or another, so I'll take the time to describe it here.

In my case, my van happened to be a 1993 voyager. It had a vertical plate with some holes already drilled through it. Actually, one hole is all you need, that is, if it is near the bottom of the plate. This is because you can use the free space below the plate to act as the second hole. You'll end up running one of the U-bolt rods through the existing hole and the other bolt will hang below the plate.

You're going to need 3 sets of the U-bolts with clamps to do this, plus one extra set of nuts. Start with one of the U-bolts and screw on the two nuts. Take them all the way to the end of the threads nearest the U. This will provide a stopping point for the 1st clamp. Next, place the 1st clamp on with the "teeth" end going in first. It will stop at the nuts you've just put on. This makes the flat end available as a stopping point against the metal plate. Run the U-bolt through the hole(s) in the plate of the vehicle and the whole thing will stop against the plate.

Next, we need another clamp to brace against the other side of the car's plate. Push it on with the flat side first this time, to butt up against the plate. Now screw on another set of nuts and tighten them so the whole thing doesn't move at all. We're almost done now.

Next, put on a third clamp and slide it in toward the last one. This time "teeth" first. This provides us with a

space now between the two sets of teeth to grab the antenna mount tubing. Don't press it all the way in, because you'll do that once the tubing is ready to be connected up. Again put on two nuts. This will hold the outside clamp in place against the tubing when you are ready to attach it. And last, put on a final set of nuts. This last set will help keep the outside two from unscrewing over time due to the vibrations of the car.

Okay, now take the remaining U-bolts into your back yard. Drive a peg into the ground and start practicing horseshoe throwing — because they are of no use to the rest of this project!

Once you've got a mounting system plan ready, the hard part is out of the way. Before you actually mount the tubing to the vehicle, first take the tubing, and attach the mirror mount (Photo B). That way you can gauge when there will be enough room for the antenna to clear the back of the car. At this time you can also get the whole thing aligned correctly too, so the antenna is going to be vertical and not off on some angle. Be sure to place some tube pipe insulation around the antenna mount tubing to keep it from rubbing up against the bottom of the bumper. We don't want to do any damage there either. Besides, I think it looks cool. Tighten everything up and then screw in the 102-inch whip. Now you're ready to run the cable.

Part	Description
Steel whip	102 inch, Radio Shack #21-903
U-bolt with clamp	3 or 4 sets, RS #15-826
RG-58 cable	50 ohm, 20 ft.
Mirror and luggage rack mount	RS #21-937
1/4 inch tubing	2 to 3 ft., for use in mounting the mirror mount
Ground wire	4 ft., enough to find suitable connection points
Hose clamp	To attach the ground wire to 1/4 inch tubing
Tube pipe insulation	—
Optional	
Cigarette lighter adapter	12 V power adapter, 10 A, RS #270-1521
Banana jack binding posts and adapters	RS #274-718, #274-716

Table 1. Parts list.

Routing the cables and ground wires

Notice that I've listed RG-58 (the thin stuff) as the coax to use. We need to be able to route the cable from the outside of the car to the inside of the trunk area. First check to see if you have any rubber water plugs in the trunk that will give you access from below the trunk to the inside. If so, this hole must be at least big enough to pass the diameter of the cable through or better yet, the diameter of the PL-259 connector. If the size isn't big enough or if there are no water plugs there, you'll need to cut off the connector from one of the ends of the cable. With no hole available what we're going to have to do is to sneak the cable in through the water seal that runs along the lip of the trunk (Photo C). I've usually seen this seal with holes predrilled on one side of the seal. By putting one on the opposite side too, you can slip the RG-58 and even a ground wire through the seal.

Start by connecting the PL-259 end of the cable to the mirror mount connector and run the cable up and under the bumper or other path that works for your car. Open the trunk and route the cable up and through the water seal holes. Once through, you can use those handy dandy quick connect crimp-style connectors to easily attach the male connector to the end of the cable which is going to the radio. Attach a ground wire around the antenna mount tubing and secure it via hose clamps. Run that wire up along the coax and through the same hole, or another, if the size is a problem. Connect the other end of the wire to any convenient ground screw you can find.

This is one of the two grounds you'll want to have in the system. (Note: I've found that some ground spots are better than others, so you might want to check with an ohmmeter to see that you've got a good short to the main body of the car.) The second connection should be a ground wire from the radio to a ground screw near the radio at the front of the car.

SWR

I typically start with the full 102"

whip and cut down from there. Before you start cutting anything off of the whip, check the SWR as is. Depending on the type of vehicle (van, car, truck, etc.) and how close the antenna is to it, as well as how much of the antenna runs along side the vehicle, the length for a good match will vary. If you do need to shorten the antenna, only snip off 1/8"—1/4" pieces at a time. Decide ahead of time which portion of the band you'll be spending most of your time and go for the 1:1 match there. Note: Most of the voice SSB activity exists from 28.3–28.5 MHz.

If you plan to bring the rig into the house nightly, you should take care to install easy disconnect connectors of some sort. I won't go into all of the possibilities here, but I ended up using banana plug binding posts and that worked nicely. If you plan on just running QRP you can get away with running direct to a cigarette lighter

Continued on page 56



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All Keyed Up

Over this neat project.

Hand-sent Morse is enjoying a renaissance. A variety of straight keys are available for purchase by Morse aficionados, including some that tip the price scale near \$200. Although my surplus J38 is still functional 40 plus years after I bought it, I decided to design and build my own straight key.

I used a milling machine, lathe, and metal-cutting handsaw to make my key. With a bit of redesign and a lot more work, you could build a similar design using only a drill press and normal hand tools.

A note on materials

I've made aluminum, brass, and stainless steel versions of my design. Aluminum and brass are much easier to work than stainless steel and should be used if you only have simple tools. Brass has a nice color, polishes up easily, and is the traditional construction material for "brass pounding." It can be lacquered to retain its sheen. If you use stainless steel, I suggest drilling all tapped holes one or two drill sizes larger than normally recommended. There isn't much mechanical stress in the key, and oversized holes will reduce the risk of tap breakage in stainless steel without impairing performance.

Bearing block

I made the bearing block (Fig. 1) from a 1" length of 1" square bar stock. In my design, the armature is restrained from side-to-side movement only by the clearance in the bearing

block slot. Mill the slot for the armature, making it slightly oversize so as to permit the armature free rotation, but without excessive side-to-side play. I found about 0.005" of excess width worked well. If the slot is too wide you may use shim washers to control excess side play. If you don't have a milling machine, it should be possible to make the bearing block by drilling and filing. In this case, aluminum or brass is a much more practical material than stainless steel.

The armature rotates in Oilite® bearings. (Oilite is a porous bronze material, with oil trapped in its interstices.) The bearings are a press fit into the bearing block. Oilite bearings are not strictly necessary, and a plain bronze bearing would likely work. An even simpler design would omit press-in bearings and instead use the bearing block itself.

For the bearings to fit, the 0.375" mounting holes should be drilled slightly undersize using a "U" drill and reamed to final size with a 0.375" reamer. Press or drive the bearings in place.

The bearings and their mounting holes must be accurately aligned, or else the armature may bind. Drill and ream in one pass from one side, rather than separately from each side.

I made the inner diameter of the Oilite bearing slightly oversize with a 0.252" reamer to ease the fit with the 0.250" axle shaft. (Passing a drill or reamer through an Oilite bearing closes up the pores and may tear the bearing surface. This would be inadvisable if the bearing were to be used at high speed, but is acceptable for a hand key.) I reamed to 0.252" after pressing the bearings into the bearing holder, taking care to align the reamer to the bearing hole. Alternatively, the axle shaft could be reduced a couple thousandths of an inch in diameter with sandpaper and the Oilite bearings kept as-is.

Armature

The armature (Fig. 2) is made from a 4-1/2" length of 1/2" x 1/2" bar stock. I milled the knob end of the armature to 1/4" to give me a better grip on the knob, but this is a personal preference item. If a milling machine isn't available, the thickness reduction could be accomplished with a hacksaw, or a file.

It's important that the axle shaft hole is made at right angles to the armature as accurately as possible, as any angular error may cause the armature to bind in the bearing block slot.

I drilled the axle shaft hole with a 1/4" drill and reamed with a 0.252" reamer. If you instead decide to reduce the axle shaft to a couple thousandths below 0.250", the 0.252" ream isn't necessary.

My design uses an upper spring adjustment washer with a hub that when fully retracted fits into a pocket milled into the armature. I used a 3/8" end mill to produce a flat-bottomed pocket.

The spacing adjustment screw can work loose as the key is used, so I added a 6-32 locking screw at the end of the armature.

Base plate

The base plate (Fig. 3) is made from a 5-1/4" length of 3" x 1/2" cold rolled steel bar stock. I like a heavy base, and this substantial block of steel meets my desires.

The bearing block and the ground connection post are mounted to the base plate with 6-32 screws. I used socket head cap screws, and used a counterbore to recess the heads of the SHCS screws to be flush with the bottom of the base plate. Alternatively, 6-32 flat head screws could be used and flush countersunk.

It's important that the screw holes that

attach the bearing block be accurately located so that the armature is centered and parallel with the long axis of the base plate.

I didn't want the spacing adjustment screw to contact the base plate, as it would, over time, chip away the paint. To give the adjustment screw a safe contact point, I drilled and tapped the base plate for a 1/4-20 thread and screwed in a 1/4-20 x 1/2" stainless steel

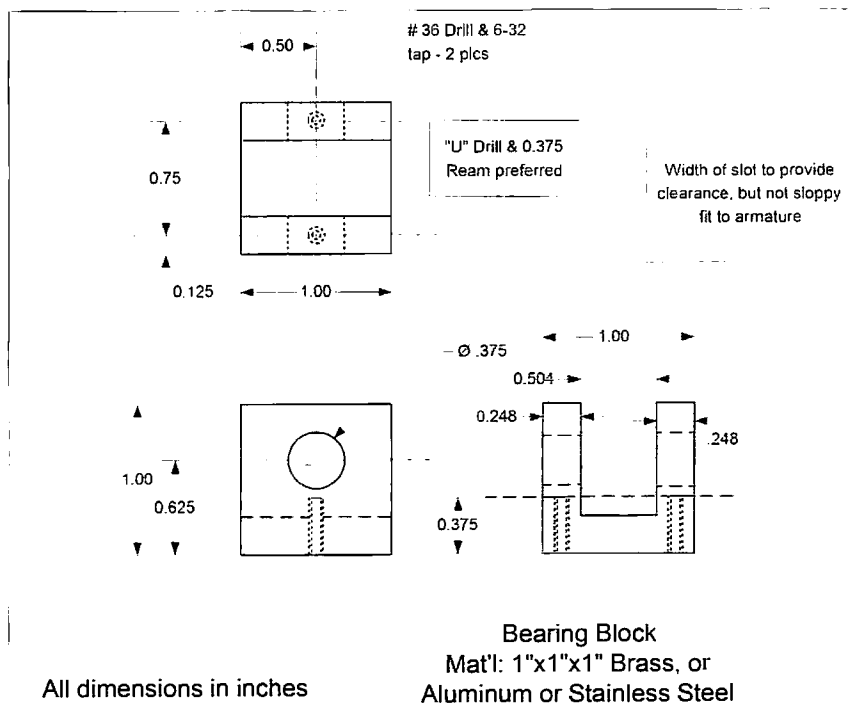


Fig. 1. Bearing block.

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Qty.	Description
1	1x1x1 in. material for bearing block, brass/aluminum/stainless steel
1	1/2x1/2x4/5 in. armature, brass/aluminum/stainless steel
2	Oilite bronze bearings, 3/8 in. OD 0.25 in. ID x 0.25 in.
1	baseplate, 1/2x3x5-1/4 in. cold rolled steel
2	3/8 in. diam. x 1 in. long drill rod for connection posts
3	1/2 in. OD x 1/8 in. thick Delrin washer, clearance hole for 6-32 screw
1	1/2 in. OD x 1/8 in. thick Delrin washer, 0.25 in. clearance hole
1	0.250 in. diam. x 1 in. long drill rod for axle
1	6-32 hex key head set screw x 3/8 in. long, cone point, stainless steel
1	1/4-20 x 1-1/2 in. stainless steel bolt, cut down for fixed contact
1	1/4-20 x 1/2 in. stainless steel bolt, for fixed space contact surface
2	8-32x3/8 in. hex key set screws
2	6-32x1/2 in. socket head cap screws
4	6-32x1/2 in. socket head cap screws
1	6-32 hex key set screw x 3/8 in. long black oxide cup point
1	6-32 hex key set screw x 1/4 in. long black oxide cup point
1	lower spring support from 1/2 in. steel rod
1	upper spring support from 3/4 in. steel rod
1	spring, 12T 0.021 in. wire 1 in. long 0.26 in. ID
1	knob, plastic or ceramic drawer pull
4	felt or plastic feet, self-adhesive
1	6-32x3/8 in. socket head cap screws

Table 1. Parts list.

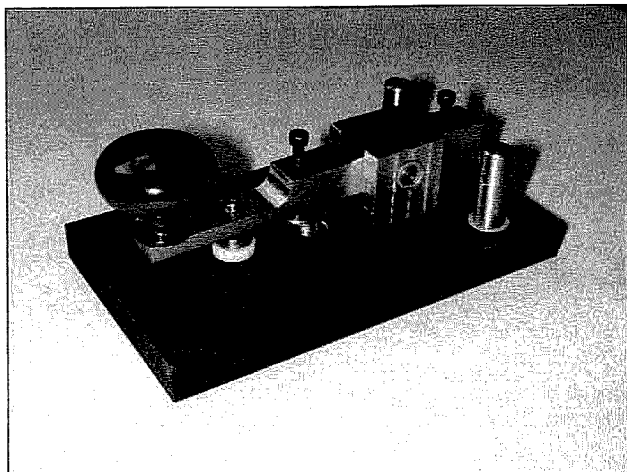


Photo A. Completed key.

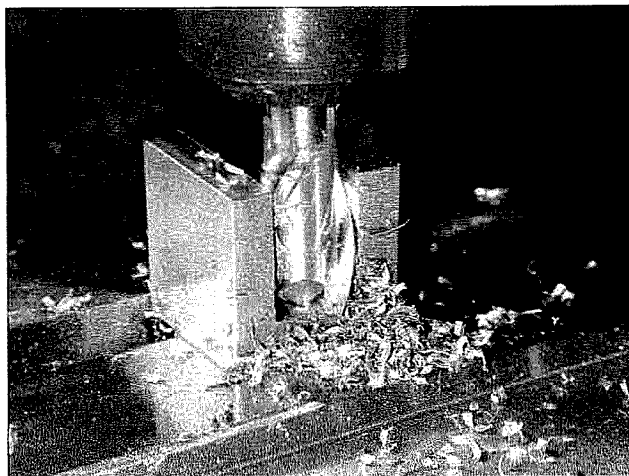


Photo B. Milling the bearing block.

bolt, positioned so that the adjustment screw strikes the bolt head. To dress up the striking point, I surfaced the hex bolt head and turned the head round. The appearance is of a smooth cylindrical pin. The round-headed bolt can be turned in finger tight and then final tightened with padded jaws pliers.

I also wanted the bottom of the spring to not contact the painted base plate. I milled a 1/2" diameter pocket 1/16" deep to hold the lower spring retainer.

The hot side connection post and the fixed contact must be insulated from the base plate. I made insulating washers from a 1/2" diameter Delrin rod. Nylon or other similar plastics would work as well. The base plate has flat-bottomed pockets to accommodate the washers. The pockets are milled 1/4" deep to permit the screw heads to be flush with the bottom of the base plate.

In addition, I milled a 1/4" wide slot between the hot side connection post and the fixed contact to contain a connecting wire. I insulated the lugs with heat shrink tubing to prevent shorting against the base plate.

Miscellaneous parts and assembly

Fig. 4 details the remaining custom parts required for the key. The drawings are self-explanatory. Since many of these parts are visible, try for good-quality workmanship — chamfer edges and polish out any nicks or scratches. When drilling and taping the connection posts, soft jaws on the lathe may reduce marring.

I use a standard drawer pull, available at any hardware store, for a knob. I've used both plastic and ceramic pulls. If you use a ceramic pull you may find it

necessary to go to a heavier spring to offset its increased weight.

I found a suitable spring at the hardware store. It is wound from 0.021" diameter wire, 12 turns/inch, with an inner diameter of 0.26 inches. The spring was two inches long, and I cut it in half for my key. Spring tension is a personal preference, and I like a small spacing, soft tension key. A good hardware store will have a selection of springs, so experiment until you find one to your liking.

The armature contact is a 6-32 x 3/8" stainless steel cone tip set screw, adjusted to have the cone part of the tip protrude below the bottom of the armature. This results in a stainless-steel-to-stainless-steel contact, which has proven satisfactory. If you can't find the cone tip set screw, you can grind the tip of a standard stainless steel set screw into a cone shape. To

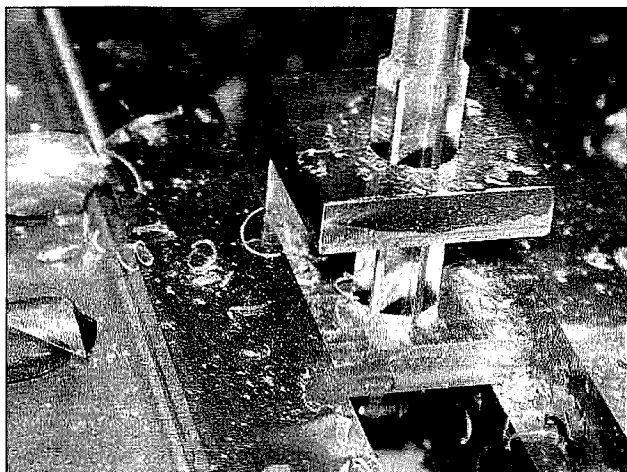


Photo C. Ream the 0.375" hole for the bearings.

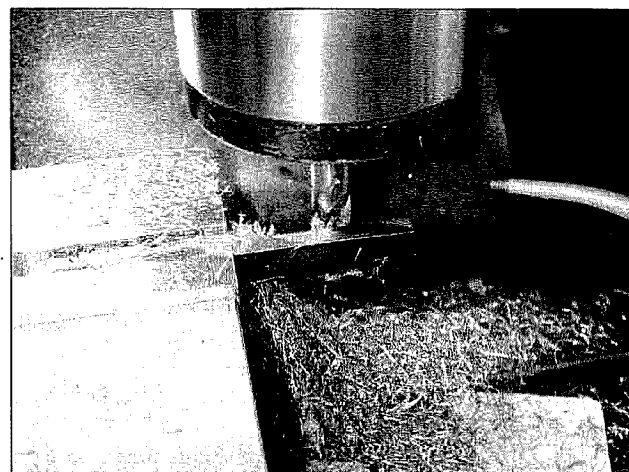


Photo D. Milling the reduced part of the armature.

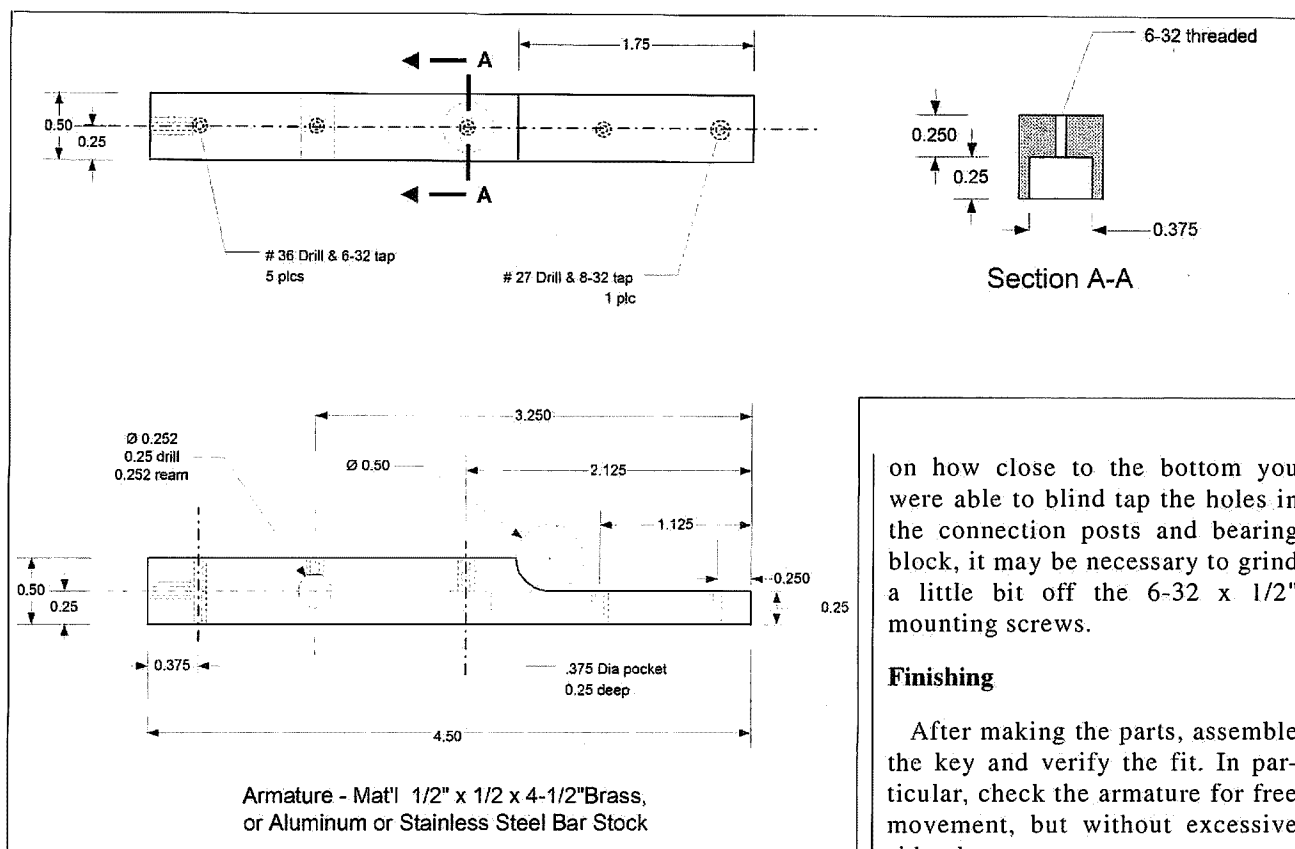


Fig. 2. Armature.

retain the set screw contact in the armature, I used Locktite 222 small thread locking compound. Fingernail polish would likely work just as well.

The spring tension retaining screw and the spacing adjustment screw are 6-32 x 1" SHCS screws. I used black oxide screws to provide color contrast, but you may prefer stainless steel.

Use a 6-32 x 1/4" set screw to hold

the axle shaft to the armature. A 6-32 x 3/8" set screw locks the spacing adjustment screw in place. Again, I used black oxide set screws, but stainless steel would provide a different appearance.

The connection posts and the bearing block are held in place by 6-32 x 1/2" SHCS. I used 8-32 set screws in the top of the connection posts, but you may prefer 8-32 thumb screws. Depending

on how close to the bottom you were able to blind tap the holes in the connection posts and bearing block, it may be necessary to grind a little bit off the 6-32 x 1/2" mounting screws.

Finishing

After making the parts, assemble the key and verify the fit. In particular, check the armature for free movement, but without excessive side play.

When you are satisfied, disassemble and prepare the key for painting and polishing.

After degreasing the parts, I sanded the base plate with a medium-grit emery paper and then painted it with a bare metal primer coat, followed with a finish coat of Krylon "Black Wrinkle." I like a wrinkle finish because it covers up minor blemishes in the base plate that might not have been removed with the sanding. Install



Photo E. Drilling the armature.

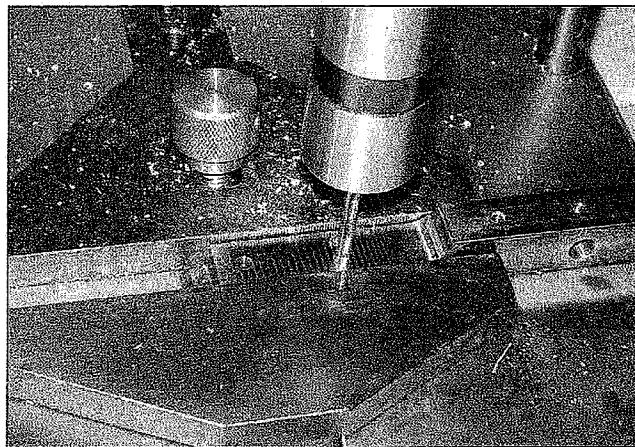


Photo F. Using a hand tapping machine to tap the threaded holes in the armature.

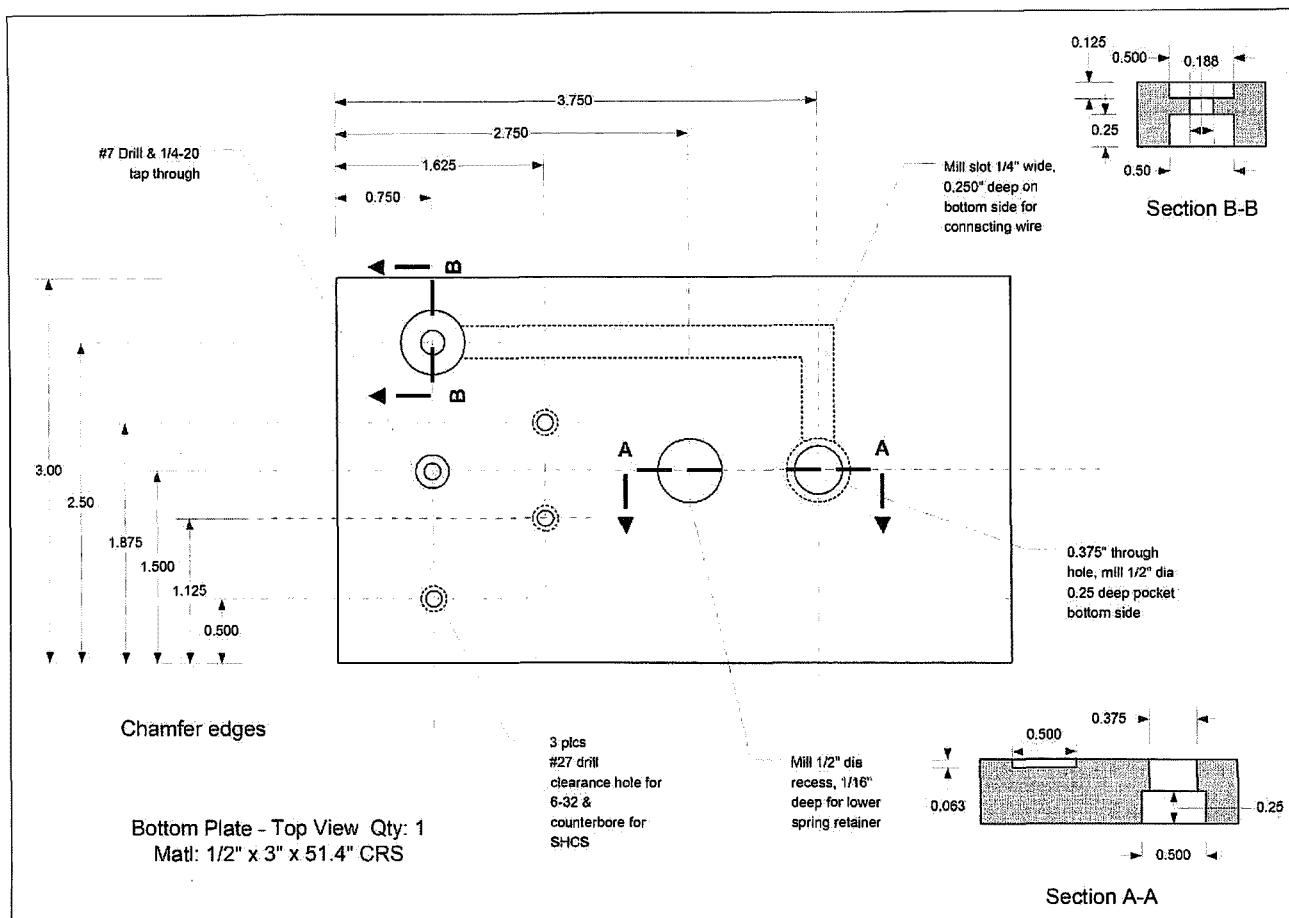


Fig. 3. Base plate.

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self-adhesive felt or rubber pads at the four corners of the base plate to stop the key from sliding or marring your desk.

I finished the armature and bearing block with fine-grit emery paper, followed by an automobile "scratch and swirl remover." This produced a



Photo G. Marking the base plate using a height gauge.

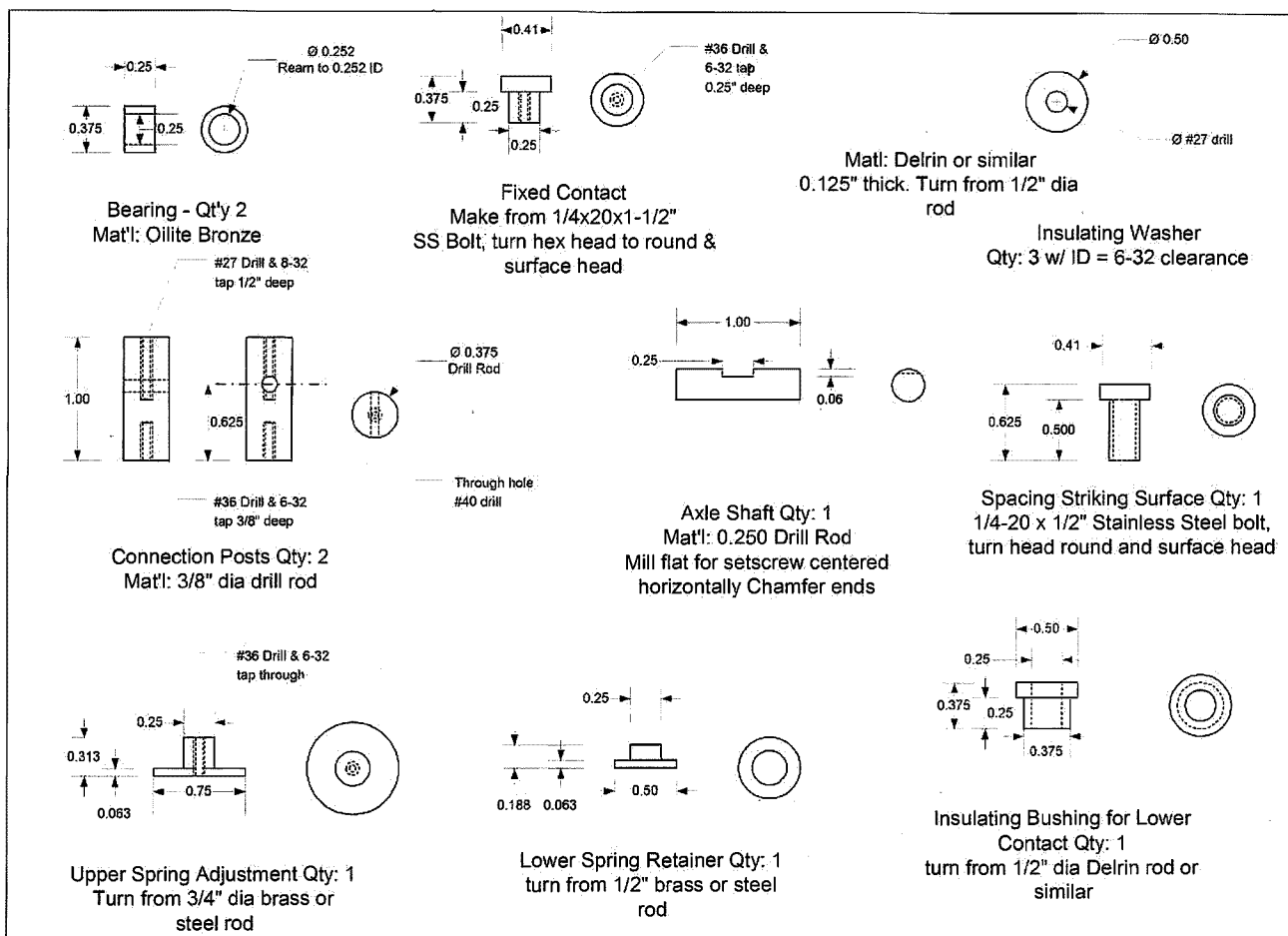


Fig. 4. Miscellaneous parts.

nice luster when applied to brass | can treat the armature and bearing
and aluminum. After polishing, you | block with clear lacquer if you

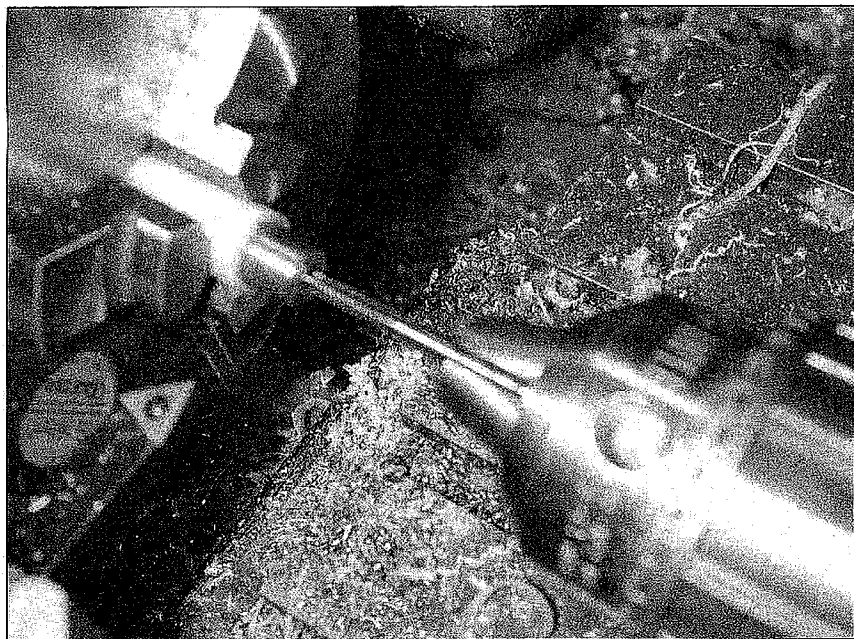


Photo H. Use a plastic bushing to prevent marking the connection posts while drilling and tapping.

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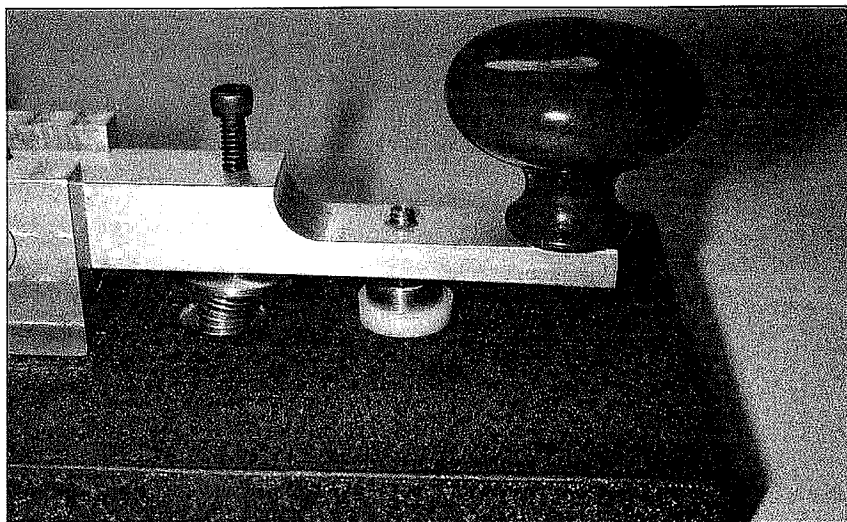


Photo I. The knob is a drawer pull. The upper contact is a cone-pointed set screw.

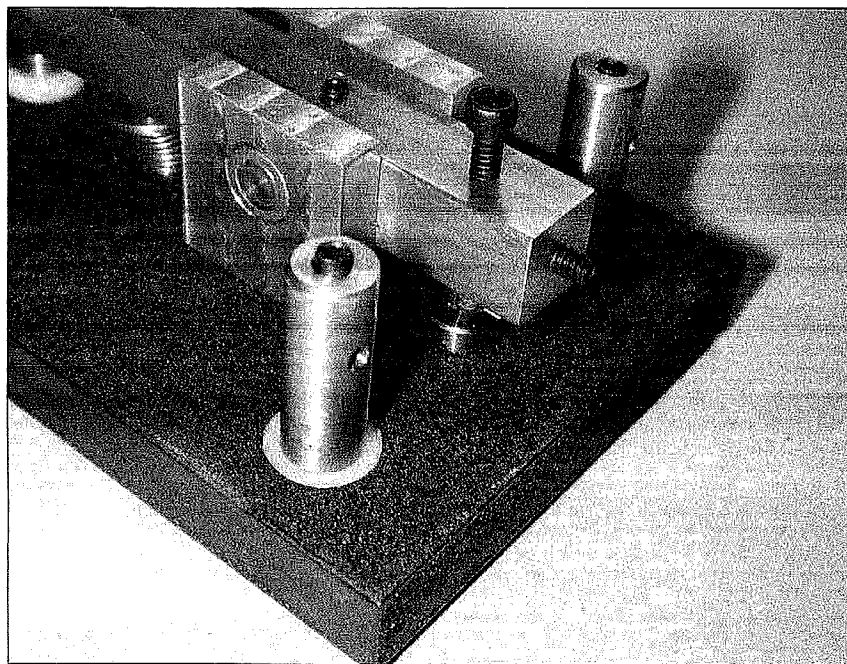


Photo J. The space adjusting screw is locked in place with a set screw.

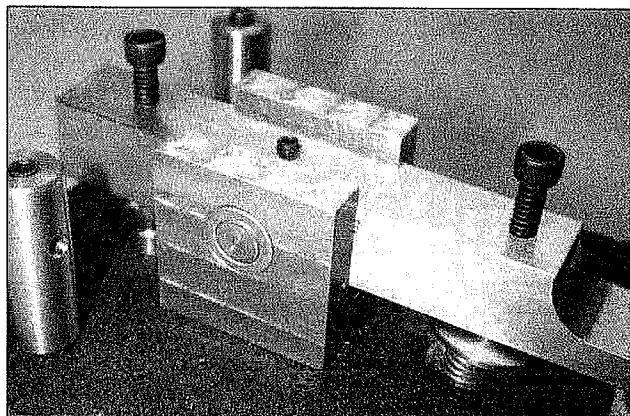


Photo K. Oilite bearings fit into the bearing block.

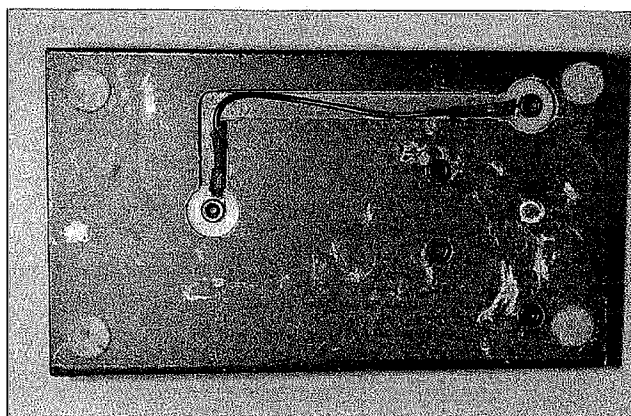


Photo L. Route the connecting wire through a milled channel.

wish to preserve the color in brass or aluminum.

After painting the base plate, go back in with the counterbore tool and remove any paint that may have found its way into the three 6-32 SHCS holes, as these screws must make good electrical contact with the base plate.

Make a short connecting jumper between the fixed contact and the hot side connection post, using ring lugs on both ends of the wire. Route the wire through the milled slot.

Parts availability

Buying small quantities of metal is often difficult. I ordered the bar stock and base plate stock from Online Metals, at Web site [<http://www.onlinemetals.com/>].

I ordered small hardware and plastic stock from MSC Industrial Supply, at Web site [<http://www.mscdirect.com/>].

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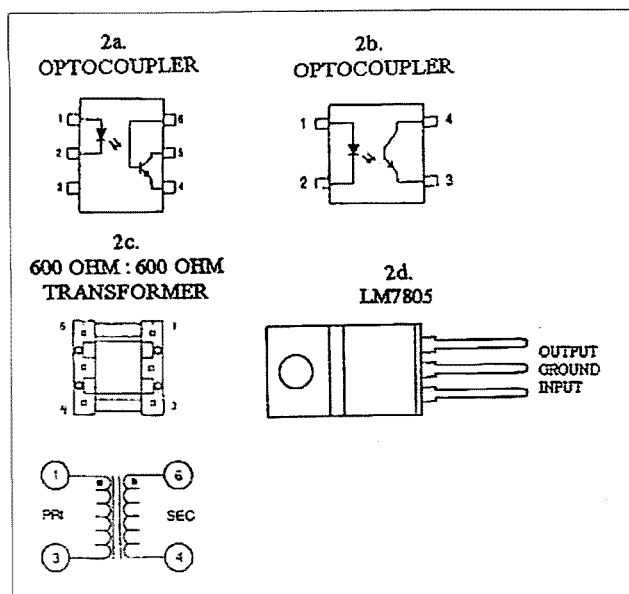


Fig. 2. Component pinouts.

Part	Description	Source
R1	4.7k 5% 1/4W	—
R2	10k 5% 1/4W	—
R3, R4	220 ohms 5% 1/4W	—
C1	470 nF 250V	Salvaged
C2	1 nF	—
Q1, Q2	2N3904	—
U1	UA7805	Salvaged
D1	1N5252B	—
D2-D5	1N4007	—
D6, D9, D10	1N4148	—
D7	Yellow LED	—
D8	Green LED	—
ISO1	Optoisolator	Salvaged
T1	600 ohm to 600 ohm transformer	Salvaged
K1	5V SPST N.O. reed relay	Salvaged
J1	Telephone jack	Salvaged
J2	1/8-inch jack	—
P1	3/32-inch plug	Radio Shack #274-289C
P2	1/8-inch plug	Radio Shack #276-286
S1	SPST toggle switch	—
Wall transformer	9V 200 mA transformer	Salvaged
Perfboard	—	Radio Shack #276-1688
Hookup wire	—	—

Table 1. Parts list.

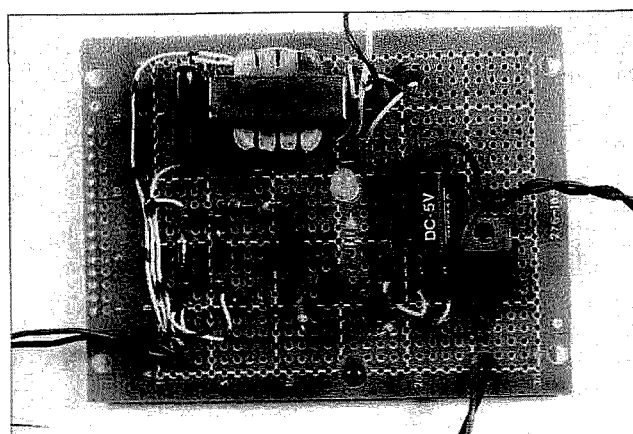


Photo A. Telephone Recording Adapter.

(Record) condition. Q1 turns on K1 (which is connected to the tape recorder "REMOTE" input).

When the tape recorder is in the RECORD mode, the contact closure of K1 starts the recording process. The 600 ohm primary of T1 is connected to the phone line through C1. The 600 ohm secondary has its output clamped at ± 700 mV by D9 and D10 to protect the recorder input during telephone rings. This clamped voltage is connected to the tape recorder "MIC" input.

Because the ring voltage oscillates below 24 volts, the yellow LED will flash during telephone rings. Similarly, K1 will open and close its contacts at 20 Hz during the ring. Depending on the tape recorder, this may cause clicks or tones to be recorded on the tape before the handset is lifted on an incoming phone call. U1 (7805) provides 5V to power the TRA from 9 VDC at J2.

In this design, a heat sink is not required for U1. S1 is used to turn the recording adapter on and off. D8, a green LED, glows to indicate power to the device is on. Turning off S1 will disable the recording function when it is not needed (during modem communications, for example).

Construction

This design uses several components which can be salvaged from a defunct cordless phone or out-of-date modem card. Some of the components that can be salvaged are U1, C2, ISO1, T1, K1, J1, and the 9 VDC wall transformer.

Examine the cordless phone or modem circuit board and remove these components (refer to Fig. 2 and Table 1).

If any of these parts cannot be located, they can be purchased new. A salvaged optoisolator is most likely to have a pinout shown in Fig. 2a or Fig. 2b. An example of a 600 ohm to 600 ohm transformer is shown in Fig. 2c. The primary and secondary may be center-tapped or the secondary windings may have two 600 ohm windings. Note that the impedance of T1 at audio frequencies is 600 ohms, but the DC resistance for a 600 ohm winding impedance is usually between 75 and 200 ohms. The primary and secondary windings may have the same impedance without having the same DC resistance.

Once these windings have been determined, use a permanent marker to label the location of the windings terminals on the transformer. K1 is a 5 V N.O. reed relay. To verify the coil terminals, use an ohmmeter to look for a resistance of a few hundred ohms. When the coil pins are determined, use the ohmmeter to check contact resistance with 5 V applied to the relay coil. The contact resistance should be approximately zero. When the coil voltage is removed, the contacts should be open circuit. When connecting J1 to the Adapter, only the two center terminals out of the six are used.

Assemble the circuit on a piece of perfboard using point-to-point wiring. A printed circuit board is not given

Continued on page 56

Meter Made

Here's how to recycle those VU meters in old stereos.

Meters from discarded stereos can be used in many ham radio projects. This article shows how to measure their characteristics and put them to use as ammeters and voltmeters.

A typical stereo set, such as the Realistic 13-1198 originally sold by Radio Shack, will have two VU meters on the front panel as shown in **Photo A**. This meter is 1.5 inches square and it has a white pointer with a black background.

Another stereo rescued from the trash man, a Superscope Imperial Model C-5060, is shown in **Photo B**. This one had a bonanza of five meters. They are 1.9 inches square. Two had a level scale (VU) shown in **Photo C** and two had a watts scale.

The fifth meter has a tuning scale. All five have a black pointer with a silver background.

Radio amateurs should have no difficulty in locating an endless supply of similar meters from discarded stereo sets. Check out neighborhoods where renters are frequently moving in and out, especially college students. The meters are easily removed from the sets. There may also be other parts of use to the radio amateur such as a power transformer, heat sink, variable capacitor, switches, potentiometer, etc.

Measuring the meter's characteristics

A meter can be characterized by the current level required to drive it to a full-scale reading and by its internal resistance. One way to measure these characteristics is to set up a circuit shown in **Fig. 1**. A 1.5-volt "D" cell and 10k ohm potentiometer are connected in series with the meter. Adjust the potentiometer for a full-scale reading on the meter as shown in **Photo D**.

Now measure the voltage of the "D" cell with a digital voltmeter. I

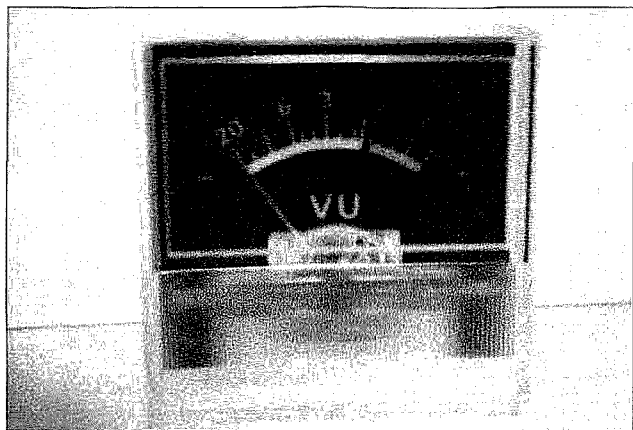


Photo A. VU meter from Realistic 13-1198.

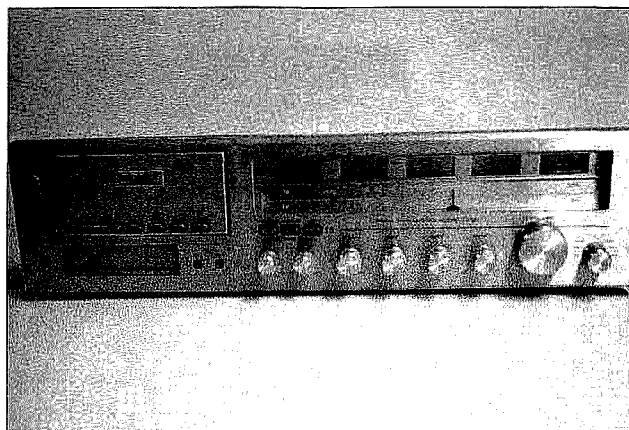


Photo B. Superscope Imperial C-5060 AM/FM stereo.

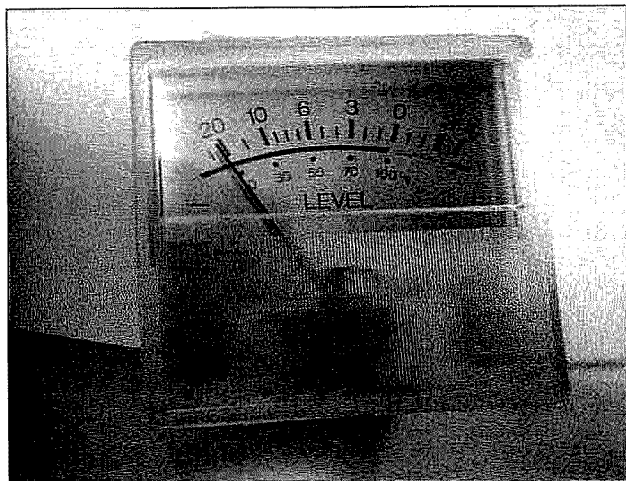


Photo C. Level meter from Superscope set.

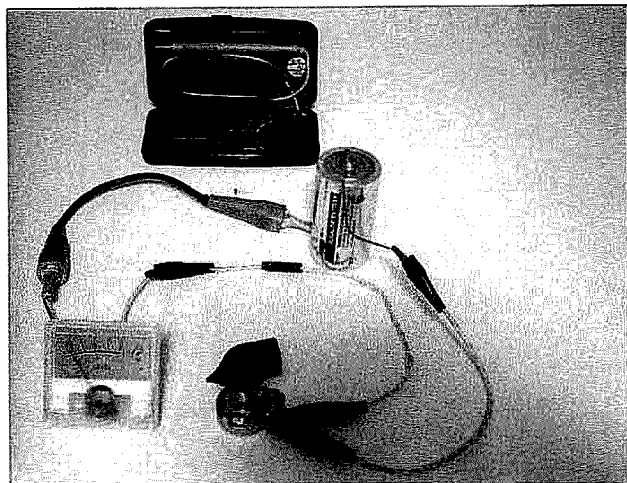


Photo D. Measuring meter characteristics.

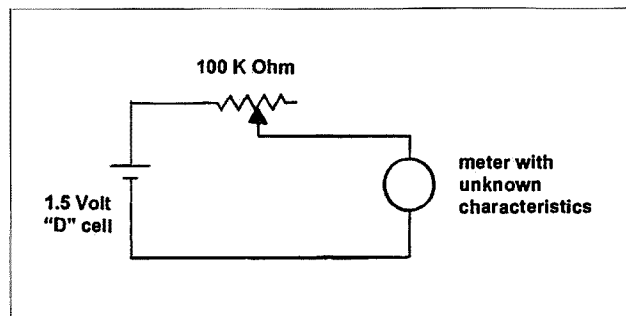


Fig. 1. Circuit for measuring meter characteristics.

Meter	Current (μ A)	Resistance (Ω)
Level 1	280	649
Level 2	258	639
Tuning	250	674
Watts 1	237	675
Watts 2	264	654

Table 1. Meter characteristics, Superscope Imperial C-5060 AM/FM stereo.

Desired Full-Scale Volts	Series Resistance (Ω)
5	17.0k
20	71.2k
100	360.0k
200	1721.0k

Table 2. Series resistors.

used the inexpensive Radio Shack pocket digital multimeter shown in **Photo D**. Then measure the voltage across the meter. There should be no drop in the full-scale reading on the

meter when this measurement is taken. If there is, then your digital voltmeter is drawing too much current and the measurement will not be accurate. The pocket digital multimeter has a high enough input impedance so

there is absolutely no movement of the needle pointer when this reading is taken.

Desired Current	Resistance (Ω)
1 mA	388
10 mA	28.9
100 mA	2.81
1 A	0.28
5 A	0.056

Table 3. Shunt resistor values.

Remove the potentiometer from the circuit and measure its resistance with the digital multimeter. Then, using formulas 1 and 2 below, calculate the meter's characteristics.

$$(1) \text{ Full-scale current} = (V_{\text{batt}} - V_{\text{meter}}) / R_{\text{pot}}$$

$$(2) \text{ Internal resistance} = V_{\text{meter}} / \text{Full-scale current}$$

For example, the Realistic meters measured: Full-scale current = $277 \mu\text{A}$, Internal resistance = 1013 ohms. **Table 1** gives the measurements for all five of the Superscope's meters. The average is $258 \mu\text{A}$ and 658 ohms.

Use as a voltmeter

A resistor placed in series with a meter allows it to be used as a voltmeter. The series resistor value is given by formula 3.

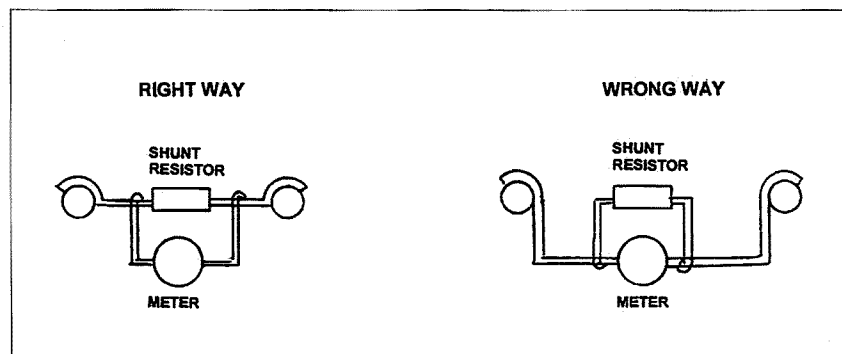


Fig. 2. Proper way to connect meter in parallel with a low-value shunt resistor.

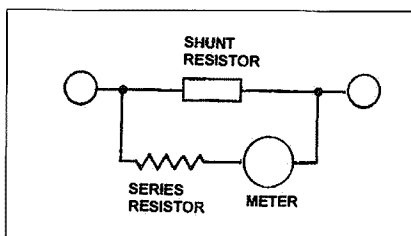


Fig. 3. Use of a standard value shunt resistor by adding a resistor in series with the meter.

$$(3) R_{\text{series}} = (\text{Desired full-scale volts} / \text{Full-scale current}) - \text{Internal resistance}$$

See **Table 2**. The closest 1% resistor can be used, or two or more 5% resistors can be combined in series or parallel to provide the necessary value.

Use as an ammeter

A resistor placed in parallel or shunt with the meter allows it to be used to measure current in milliamperes or amperes. The required shunt value is given by formula 4. The values will be in the low ohms range.

$$(4) R_{\text{shunt}} = \text{Full-scale current} \times \text{Internal resistance} / (\text{Desired current} - \text{Full-scale current})$$

Table 3 gives some typical values for the Realistic meter.

Two or more standard-value resistors can be combined in series or parallel to provide these odd values. For low values below one ohm, it is important to connect the meter across the

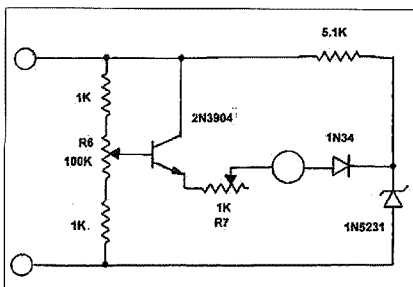


Fig. 4. Expanded scale voltmeter circuit.

shunt properly to minimize the effect of resistance in the connections. See **Fig. 2** for details.

The selection of low-value resistors available to the experimenter is very limited. If a particular low-value resistor is available, it may be possible to use it in the circuit shown in **Fig. 3**. A resistor is placed in series with the meter. The series resistor is calculated from formula 5.

$$(5) R_{\text{series}} = [(R_{\text{shunt}} \times \text{Desired current}) / \text{Full-scale current}] - R_{\text{shunt}} - \text{Internal resistance}$$

Of course, if the calculated value of R_{series} comes out to be negative with this formula, then the circuit of **Fig. 3** cannot be used with that shunt resistor. A higher-value shunt resistor must be selected. Note that the circuit of **Fig. 3** will also have a larger (but still small) voltage drop across the terminals than the direct shunt circuit of **Fig. 2**.

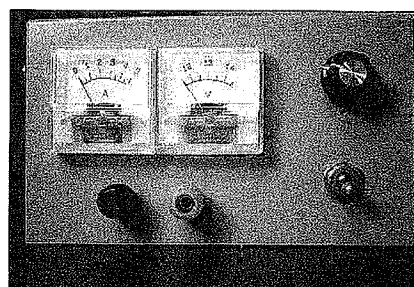


Photo E. 12-volt adjustable power supply.

Use of meter as a suppressed-zero (expanded-scale) voltmeter

In some applications, such as the 12-volt power supply described later in this article, it is desirable to have an expanded voltage scale. A circuit developed for the battery fuel gauge from *Electronics Now*, April 1997, pages 58-59, 74 can be used. See **Fig. 4**.

A percentage of the incoming voltage, set by R6, is compared to a fixed voltage set by a Zener diode D1. Only when the voltage exceeds this value does the meter start to indicate. The left and right ends of the meter scale can be set by adjustment of R6 and R7 respectively.

Circuit boards for the fuel gauge, as well as full kits, are still available from Unicorn Electronics at 1-800-221-9454 or [www.unicornelex.com].

Variable power supply using recycled meters

You can use recycled meters to read

Continued on page 57

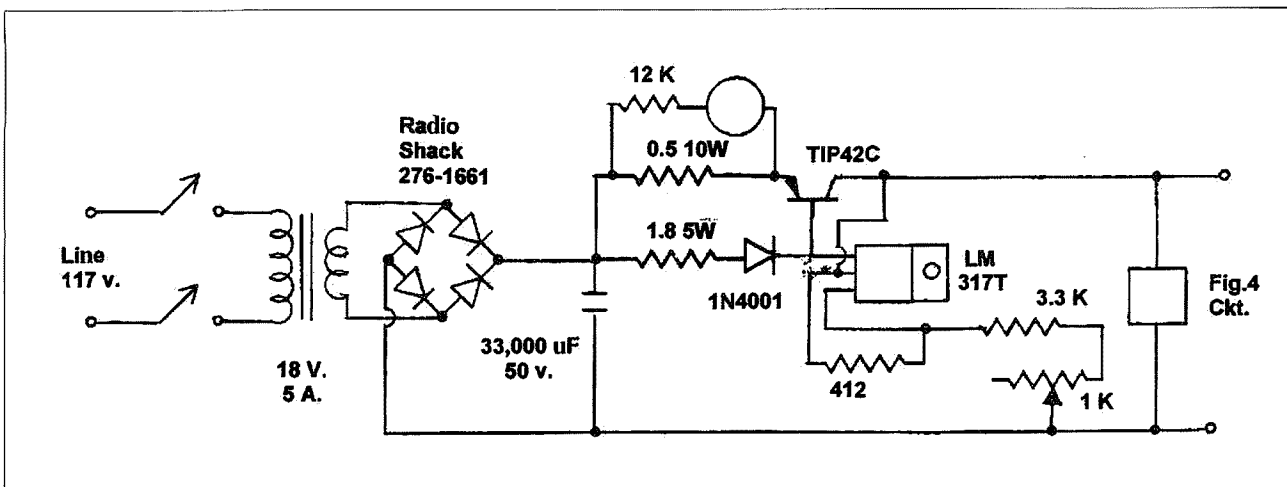


Fig. 5. Adjustable power supply circuit diagram.

Autobiography of Everyham — Part 1

How many times do you see yourself in this story?

Amateur radio has, for many decades, been one of the more undervalued contributions to our communities. Having begun as a group of experimenters before the term "engineer" was used for much more than the guy driving a locomotive, these early pioneers helped develop radio communication as we know it.

During the evolution of radio, these experimenters were pushing the envelope with the development of new transmission modes, transmitters, and, well, basically anything radio.

As technology progressed, it developed complexities that could no longer be dealt with effectively (and developed further) without the aid of an electronics laboratory, or at the very least, someone with scientific training and access to appropriate tools. This led to the lament that the modern amateur radio operator was no more than an "appliance operator" — one who buys his equipment ready-made, and is either not inclined or not trained to repair it. Combined with certain antisocial habits exhibited by a minority of operators, it has often been asked, "What's the future of amateur radio?"

To give credit where credit is due, there are a few remaining operators out there who realize that amateur radio is, indeed, a service (the rules and regulations published by the Federal Communications Commission state that very clearly). When conventional communications systems are overloaded during emergencies, there are

still amateur radio operators who will jump in and volunteer their services. During special events, special service clubs often contribute their communications skills to keep things running smoothly. A certain minority still even use amateur radio as a "test bed" for their experimental circuit development; learn about the propagation characteristics of various frequency bands, or of antenna types, or indulge in other learning processes that add to either their own knowledge pool or the accumulation of knowledge for the amateur radio community as a whole.

Whether these contributions will suffice to convince the FCC that we are allowed to maintain our access to valuable frequency spectrum, and for how long, remains to be seen. The only thing for certain is that demands for more radio spectrum will continue to increase (brought by pressures from the cellular telephone industry and the public service sectors, especially in larger metropolitan areas where there are many such services requiring an ever increasing amount of "elbow room").

My amateur career is rather unique in that it began at the cusp, between the age of experimenters and the era of

the "appliance operator." Having one foot firmly planted in each epoch has given me insights into, and the best of, both worlds. For those who share this unique position (or those I met on the way who came along for the ride), the experiences have, for the most part, been interesting at the very least, if not memorable. Having received my first license in 1976, I have had the longevity in the service that has given me the opportunity to not only be part of many unique experiences and historical events (such as having been active on the first 220 MHz repeater in Illinois), but to have also provided the chance at reflection and introspection over several decades.

The longer I am around, the more newcomers seem to ask me what it was like, either in amateur radio in general, or on their favorite band. At other times, one of the twists and turns that commonly take place in a longer conversation spark a memory of a certain event in history that lead to an interesting or otherwise useful anecdote. While I don't mind rehashing some of the more poignant or humorous events (especially when suitably bribed with beer), I am as susceptible as anyone else to the foibles of memory, especially

as the years advance. To minimize these pitfalls in memory, a written version seems in order.

Early years

The majority of amateur radio operators I met in my early years — and this happens to a more limited extent today — earned their licenses as an off-shoot of their employment: maritime radiomen wanting to extend their interest to other services; radio engineers who thought it would be the fun thing to do; or military radio operators wanting a place they could carry on with what they enjoyed doing but in a more leisurely environment.

From them, I learned many good operating practices (most led by example), or in the case of the engineers, got help in developing my first insights into what it takes to put together a good radio setup (and other technical advice).

But, as far as the actual licensing is concerned, I was a bit of the "odd man out"; I was too young to be a ship-board "sparks" (my dream job that I've never been able to get — born too late!), and it was too early in my schooling to be considered anything even remotely resembling an engineer. Instead, I had developed my interests in radio by other means. The first exposure to radio was gained via an old shortwave receiver I found in my grandmother's closet when I was very young. They had bought the radio when they first emigrated to America: it was about the size of a small suitcase and was a tube radio — the early version of a Zenith Transoceanic. One thing I always enjoyed about the old tube radios are their ambiance: the soft glow of the tubes (unfortunately not visible on the Transoceanic, but on subsequent radios I had, they made a unique night light!), the subtle hum of the power transformer, and after having been on a while, the smell of the oil used to machine the metal parts (a residue always seemed to be on the chassis). Too bad even the best modern technology can't find a way to recreate that kind of nostalgia!

After establishing my initial fascination with hearing all those interesting

signals from far-off lands, it didn't seem all that long afterwards until, a few years later in junior high school, I came across a fictional book in the library (even back then I was an avid reader) whose main character got his "ham" license.

This sparked my curiosity even further, and one coincidence led to another (the first being that I had found that book in the school library to begin with). Shortly after I finished the book, the junior high school's vice principal started an amateur radio club. Thinking it had been established for those who already had a license, I missed the first meeting, but after mentioning the interest to my parents, I was encouraged to attend subsequent meetings. Fortunately, my first assumption had been wrong; the club had been set up for those who wanted to learn to get their license. This was back in 1976, the day when the basic beginner license was the Novice class: Slow Morse code speed and technical knowledge were both required for the test; licensees were still given the unique prefix of "WN" to denote their status; license terms were still two years, and; a single person holding a General class or higher-level license could still administer the FCC theory test, after sending in paperwork stating the student had successfully passed the Morse code requirements. This was still the case when I was in college in the early 1980s, and I administered the test to a few people at the college I was attending.

My dad (an electronics engineer at that time) built my first code-practice oscillator, and helped with tutoring outside the junior high school club environment. Of about ten members, approximately half survived the code test; of those, only two of us passed the written test to get our licenses. Back then, there didn't seem to be all that many school clubs. Either they had gone defunct (like, as I learned later, my high school club had), or they had not gotten the word out as successfully as clubs seem to do today. Relatively recently I even read in a ham magazine that there was a Special Event day where school clubs tried to work as

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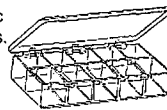
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many stations as they could, garnish-
ing extra points for working other
clubs. Although we had discussed put-
ting together a school radio station in
my junior high, it unfortunately never
came to pass.

Even the process of getting licensed
provided its entertaining aspects. Al-
though I may not have been the "per-
fect" student, I was able to avoid
more serious trouble. When the
school's intercom paged me to the vice
principal's office (he was responsible
for looking after the troublesome stu-
dents, among other things), my esteem
in the eyes of the tougher kids went up
a notch. Keeping the actual reason for
the page a mystery enhanced my statu-
s; having been one of the students
singled out for being "picked on" by
other kids, the status as an imperfect
student encouraged others to look
elsewhere for whom they picked on.
Fortunately (as an additional benefit),
these calls to the vice principal's office
were related to urgent club business,
typically a last minute schedule
change for our meetings. Getting out
of what I thought to be a boring class
didn't hurt, either!

A surprise from the FCC

The early days of my amateur career
also provided my first scare. My dad

and Mr. Panczyk, the school's vice
principal, put up a 40-meter inverted
"Y" on the house; the old tube radio I
had (a Drake TR-3) would tune it on
40 and 15 meters (a solid state radio I
upgraded to many years later, a Drake
TR-7, proved to be more fussy and I
needed a separate antenna for 15). I
had barely any time at all to get on
the air (the first time was with Mr.
Panczyk; we spent more time on the
telephone than on the air), when I re-
ceived a letter from the FCC. It put me
into shock; realizing my inexperience
on the air, I had always used above-
average caution to avoid problems.
Besides, I hadn't even been on the air
long enough to get into trouble! Fortu-
nately, it turned out to be a pleasant
surprise. I had received my license at
the point where the FCC dropped the
rule of giving Novice class operators
distinctive call signs. Typically novices
who were licensed before then had to
upgrade to the next higher class to lose
that prefix, but since I was pretty much
right on the dividing line between the
two, they had given me an updated call
without my having to do anything.

Trying to get on the air in the first
place can present its own set of prob-
lems, as a test of the determination of
the licensee. After a pleasant Saturday
morning outing to a ham store about

75 miles away during beautiful weather,
going through some very enjoyable
Wisconsin scenery, we got back to
within two miles of home, only to have
a car accident (fortunately, no inju-
ries). Shortly thereafter, the one and
only family car was stolen (a 1968
Ford Galaxy — a car I was hoping to
learn how to drive in, and buy from my
dad at the appropriate time). Although
my dad was a help initially in getting
licensed and on the air, it wouldn't be
for a few more years that any mobile
radio work would be done. This was
approximately 1977, when my dad in-
stalled a CB in a used 1974 Mercury
Comet, a car I would learn how to
drive in, and use as my car for almost a
decade afterwards.

Just like today, the best bargain and
best way to get on the air was with
used equipment. Back in those days
when I first got licensed, that still
meant manually tuned tube equipment;
the operator would pick an operating
frequency, and through the turning of
several controls in a given sequence
specified by the radio's owner's
manual (usually read three or four
times through) would tune the radio.
The radio was then tuned to a certain
operating frequency, give or take a
few tens of kilocycles either way. The
operators who could afford to buy the
parts typically did most of their tuning
with the radio switched to a dummy
load, and then tweaked the tuning on
the antenna afterwards. This was the
politer, and probably more legal, way
of doing things. More creative opera-
tors would calculate how many light
bulbs were required to handle the out-
put power of a radio, taking into ac-
count the "on" impedance of light
bulbs. Some of these operators re-
ported surprising results with light
bulbs, typically in the form of working
another station a few states over with
their "light bulb antenna," to the aston-
ishment of both parties involved. The
rest of us just tuned up right on the air,
after listening for a clear spot on the
dial.

The actual act of tuning a radio, in
itself, was not that big of a problem to
anyone who could understand the
radio's owner's manual and have a bit

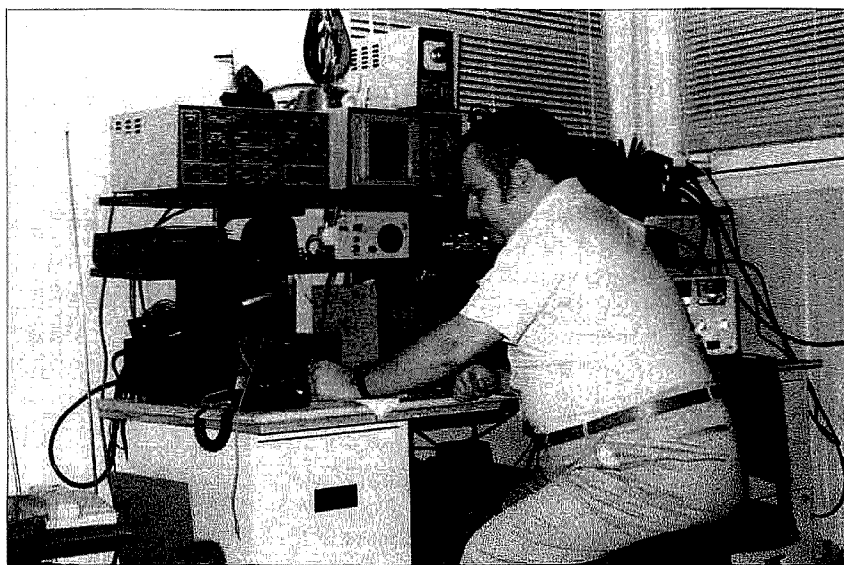


Photo A. Inner sanctum: Klaus WB9YBM at his operating position. Hidden from view on the center shelf is a 220 MHz radio and 10m all-mode transceiver. To the left, next to the cordless telephone (on the shelf), is his SWL receiver and scanner, conveniently located next to his bed.

of decent dexterity and eye-hand coordination, since tuning involved watching a meter while twirling knobs. The challenge was in the technique of tuning. Even when owner's manuals provided pre-sets of the tuning controls, these were typically just rough estimates used as a starting point, with variations being caused by exactly where in a given band it was that the operator was tuning, how well the antenna was matched in its tuning point, and variations in all the myriad components in the transmitter. It was not unknown for an operator to blow out expensive transmit tubes because key-down times during tuning were too long, or the pauses between transmissions were too short to allow component cool-down.

At the very minimum, the clumsy operator would cause damage to components just short of total failure, leaving him to wonder why things like transmit finals didn't last as long as they did for other operators. Usually the more astute operator would add listening as a positive attribute to properly tuning a radio — danger signs like arcing between the tuning plates of the air variable capacitors could be heard in the early stages of improper tuning, as could the smell of ozone in the more severe cases. A good operator knew to have eyes in two places at once — the tuning meter, and looking through the cooling slots of his radio, backing off the power when the cherry red glow of the tubes' plate got a bit too bright. It's unfortunate that these techniques aren't being properly passed down from one generation to the next; inevitably, there are always going to be hams out there interested in antique radios who need to know these tuning techniques, and to this day I haven't seen them mentioned in any manuals, nor have I heard too many teachers pass these things along to their students.

Since actual transmit tubes were either unavailable or too expensive for the ham community, most early radios used television sweep tubes (two or three in parallel) for finals. Just like their transistor counterparts, they had to be replaced in, and bought as,

matched sets. Even adding a fan to a transmitter didn't seem to extend the tube life all too much longer, especially when the modulation mode used increased the duty cycle, as with RTTY.

Rule changes

During my high school years, being too busy with school studies, I had little time left to think about upgrading my ham license. Fortunately, during this time the FCC came to my assistance with two rule changes. First, the two-year license became renewable, and when I went to renew, they had changed it from a two-year to a five-year license. Luckily, I enjoyed Morse-code operations, and took every chance I could to operate. This stood me in good stead when I upgraded to General class a few years later (code speed requirements were still 13 wpm back then). During summer breaks I studied for my upgrades, first to Technician class in March of 1981 (this was when exams were still given at the Federal Building in Chicago); this was probably one of the more unique graduation gifts anyone could receive, since I graduated from high school in June of that year. I earned my General class license in March of 1982, when the exams were no longer at the Federal building, and the FCC was renting

meeting halls in hotels in suburbs to administer them. Further upgrades seemed a long way off, since I was now allowed to operate everywhere, and with every mode, that interested me.

This was the time when there were still two further license classes to go: Advanced and Extra. The benefit of working up from license class to license class during the period licenses were structured like this was that it was like going up a ladder rung by rung: You weren't overwhelmed by needing to take theory and code at the same time, except for the Novice and Extra exams. Since my upgrades were spaced apart a good amount due to my school obligations, my voice communications was limited to listening to shortwave. To help me avoid frustration at not being able to join in that aspect more directly, my dad got us started on citizens band during my high school years, initially getting a license for his business. I would later get my own CB license when I was of legal age to do so. We lived two miles away from an expressway, so I did my share of community service by helping the truck drivers find their destinations in and around our suburb, and steer them towards restaurants where truck parking was allowed. During bad weather, I'd listen to the emergency channel and provide help there (too

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Photo B. Joe W9CYT/SK, long-time Elmer and friend, shown operating 220 MHz. Note the 160m AM Collins cabinet in the background; and home-brewed coffee-can duplexers for 220 MHz standing on a stack of magazines next to the Collins.

bad the amateurs have never decided on any one frequency as an emergency frequency; it has its uses!).

Although now I live too far from an expressway to be of much use to the professional drivers out there (and this

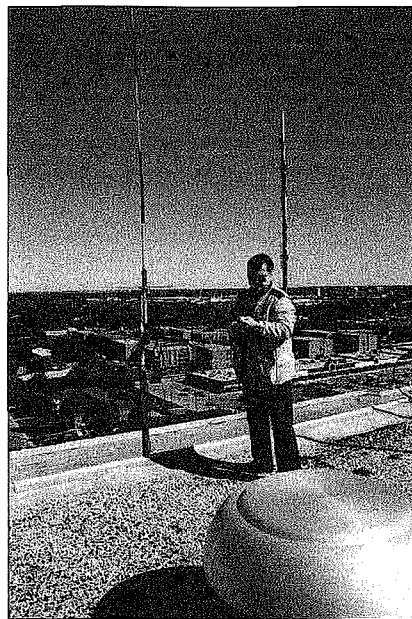


Photo C. Joe WA9ZMY, providing a tutorial on repeater maintenance on the 224.78 MHz repeater site.

might change in the future, but for other reasons), I still find CB a useful tool when driving long distances, especially on the highway. I've never understood the reason for some hams having a snobbish attitude towards CBers. There have definitely been several instances (and these have not been isolated cases) where I received more courteous treatment from CBers than I did from some hams.

Getting on voice the first time on the ham bands — and for me that was on forty meters — was a real treat, in that communication went at a better clip than what could be done with code. I could finally get a much better firsthand glimpse of far-off places than previously. The main drawback I saw firsthand (I had heard others discuss it before, but up until then it was only a theory to me) was that voice gets clobbered real quick with noise, and on forty that meant (especially at night) fighting all those shortwave broadcasters sharing the band back then. Since that time, there has been a bit of reshuffling of the voice subband on forty, and due to budget cuts many shortwave broadcasters have left the air (or as a minimum drastically cut back on their transmitting schedule and frequencies).

Of course, this did not mean forgetting the code entirely. Whenever my parents went on vacation, there was a strong possibility that another antenna would find its way to the roof. Since I was studying electronics throughout high school and college, the primary equipment was financially subsidized until I was eighteen, since my dad felt he should help with my education. Subsidies were typically limited to 50% and to primary gear (not the "extras"), because I was also using the station for enjoyment. So, the extra antennas were something I could afford on my own money, and did not need to ask for extra cash. After my dad's initial screaming that his house was starting to look like a porcupine, I reminded him how important he thought education was and this was, when all was said and done, part of my education. Wire antennas were, fortunately, not very obtrusive especially when

kept in the rear of the property and covered by several trees in the front and side yards. All that passers-by saw were a few masts rising up and vanishing into nowhere.

One of these new additions (a dipole for eighty meters) led to a memorable QSO. It was late in the evening (which may be part of the reason that the band was as empty as it was), and the band seemed reasonably open; I heard one or two stations, very faintly, coming in from some far off land. After scanning the band, I was surprised at how underutilized it seemed. After not finding anyone to call, I decided to call "CQ" on my own. A station in southwest Wisconsin answered my call, coming in about S-2 to S-3, with almost S-0 noise levels. We were pounding brass (me with a home-made keyer I had built for a high school electronics project, him with a straight key) for about two hours. At this point, he begged off, claiming his fist was getting tired. Although it's been many years since this happened, I'm still curious how long we could've continued — we were deeply involved in an interesting discussion, and who knows where it would have led. Even more phenomenal is that during the entire time we had no interference, no detrimental signal fluctuations, and no one chased us off of "their" frequency.

Chasing paper — NOT!

I've never been a "paper chaser"; if I happen to qualify for an award somewhere along the way, fine, but I refuse to break my neck in the process. If a DX station doesn't acknowledge me on my third or fourth try, to heck with it; I'll wait either for another DX station, or until I catch the same station but without the pile-up. I'm probably the only station that took an entire seven years to complete the Worked All States award (would've been a year or three earlier if Wyoming would've shown up sooner. As it was, I caught it more by a bit of luck than actual intent). Of all the places to find Wyoming, it was on 75-meter phone (the last place I expected to hear that state). Thanks to a bit of insomnia, I was up to the unholy hour of eleven in

the evening, tuning across 75/80 meters. I stumbled across a net, and checked in. Although I finally got tired, managed to stay awake when I very faintly heard a station mention he was in Wyoming. Although he signed off, his XYL picked up the microphone during the last portion of the net, in order to finish things up. After the net closed down for the night, I tried giving her a call, but she didn't hear me. Fortunately, the net control station was still around and offered to relay any messages that I might have. I explained the situation to him, and thanks to him encouraging the Wyoming station to crank up her volume control and to "listen real careful," I was able to make the contact. She included a very nice hand-written note with her QSL card (which I've kept along with my QSL card collection), wishing me luck with the WAS award. That award might've taken longer than usual, but unique contacts like this made the journey a lot more interesting. What good is an award, if there isn't an interesting story to go with it? (Like the time I got my Worked All Continents award; when I realized all I needed was Africa and I heard a station from that continent the first time, he must've thought I was going nuts by the way I was begging him for a contact — "yes, yes, OM, I know your dinner's getting cold; with profound apologies to your wife, just a quick contact puh-leeceze!" — by this time, both of us were chuckling; more importantly, I got the QSL card.) Would've helped having an antenna farm mounted on a ridiculously high tower and running a nuclear-powered amplifier into meltdown conditions, but what's the point to an award if it's that easy? Did it all with inverted "V" or dipole antennas, running legal limit power only when necessary (it isn't as necessary as often as one might think); otherwise I made do with 200 watts.

By this time I managed to jump on the 2-meter bandwagon. It was a big thrill being able to put up an actual gain antenna, because at those frequencies even a gain antenna is a lot more reasonable in height than the HF equivalent. With this in mind, I still

have a hard time figuring out what possesses someone to put a 1/4-wave antenna up, especially for 440 MHz. Even though I was not talking with far-away places on two meters, it had its own type of perks — like getting the chance to actually meet the faces behind the voices (have you ever noticed how seldom people look the way they sound?). Given the type of operating going on, on two meters, especially in the crowded, big-city environment, it did not take long for me to want to escape to new frontiers in VHF or UHF operation. Six meters — the only band (except for the remaining UHF frequencies) that I had not explored yet — was out of the question, since it's a neighbor of television channel 2 which is in active use in the Chicago area, and I was creating enough QRM already. Besides, the things called "cable television" and "satellite television" hadn't even been heard of in the early days of my ham radio operations — people were still using antennas to receive their television signals.

Good fortune once again intervened, and just at the right time. One of my uncles, who at that time was a car mechanic, knew a tow-truck driver who was an avid CB enthusiast — the type of CBER who was perpetually looking for a radio with more channels, more power, more this, more that. Somehow, someone sold him a Midland 13-509, and then realized that he (after a few tries) couldn't use it. He couldn't figure out why and was at the point where he was frustrated enough

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to toss the radio out, and my uncle mentioned to him that his nephew (meaning me) was into radios, and there might be a chance I could use the radio for something or another.

Sometimes the most unique flashes of opportunity produce the most interesting results, and this was one of those times. The Midland 13-509, a rock-bound twelve-channel 220 MHz radio, was built in the early to mid-1970s; several other manufacturers such as Cobra and Clegg marketed identical radios but with different face plates, making them the default standard types of radios for 220 MHz operation. The 2-meter versions of these radios were practically identical, except that one of the frequency triplers in the power amplifier stages was replaced with a doubler. These radios were built in an era before manufacturers were over-cautious with part numbers; all the parts found in the Midland Radios were labeled with the generic part numbers found in parts stores, making repairs easy. Back then, the idea of shrinking radios as far as possible had not been thought of, leaving plenty of room in them for maintenance, and even adding small little circuits a home-brewer would think of in order to add little "extras" to the radio. These radios were also designed with everything on a separate printed circuit board, making the receivers or transmitters

easy to remove for use in home-made repeaters.

Although I had a radio with only two frequencies — the national simplex calling frequency and one major Chicago repeater — I was soon led to one or two other frequencies by the "regulars" on that band, found a few additional frequencies to try on my own, and quickly got hooked on 220 MHz. The operations on that band certainly seemed a lot more relaxed and polite than I had seen on 2 meters, so I had fewer qualms about investing money in the band. By this time, I was through college and on my way to the working world, making equipment purchases easier. My interests in 220 had gotten to the point where I wanted a synthesized rig, but since I had my trusty 509 as a mobile and base radio, I decided on an HT.

The big rage at the time were the Icom-series HTs; the selling point was that they had shrunk a radio to the height and width of a dollar bill (without the battery pack), although they were still relatively thick. It would be a trusted companion for many years, even in the mobile (with a variety of amplifiers for mobile operation, ranging from 15 to 25 watts). 220 MHz operation brought new friends, and a better class of operation. It was the first VHF band where rag-chewing on repeaters was actually not only allowed

but encouraged, something that had been unheard of during my 2 meter days. It got to the point where a friend of mine and I not only played chess games on a repeater, but the gentleman we received permission from for that rag-chewing even kibitzed, and my chess playing certainly needs the help!

Even during periods of high activity on that band, people could be found rag-chewing on the national simplex calling frequency; if someone else needed the frequency, things were sociable enough so that there was never any problem letting them in or having them join in the conversation. I became part of a group that boasted being the first 220 MHz-only repeater club in Illinois (maybe even over a larger region). Luminaries like Bill Halligan, founder of Hallicrafters Radio, had been a member of that group before I came along. I regret having missed him, although plenty of interesting others made up for that along the way. That repeater was unique to the point where even several years after the repeater had gone off the air, people were still talking about it. That led me to research the repeater and assemble a history for it; copies went out to all the past members that I could find. Subsequently, it was published in a more official manner by *QST*, in their "FM" column — page 112 of their November 1995 issue. Unfortunately, my friend Joe W9CYT passed away in September of that year; he missed seeing the advanced copy I received from the ARRL by a matter of only a few weeks. Having stayed in touch with his widow Emma, I made sure to drop off a copy with her, along with an 11 x 14 picture of Joe in his ham shack.

Although declined somewhat from its initial splendor, 220 had always been known as the "gentleman's gentleman band," so any problems on that band were typically handled in a polite way. Over many years of operation, there were two or three of us with quite the talent for being able to rag-chew for long periods of time; three to five hours were often typical. One operator in particular I met on the calling frequency was a local, only about five miles away from me, living in Chicago.

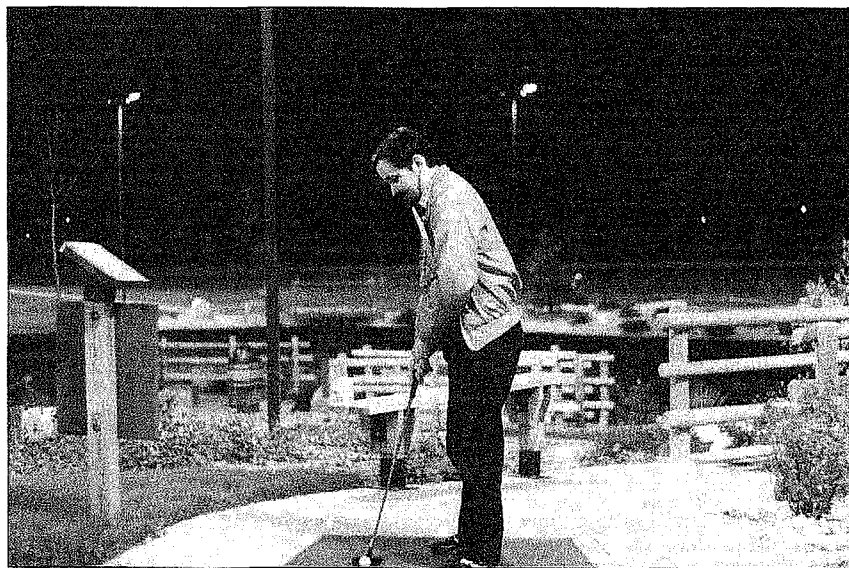
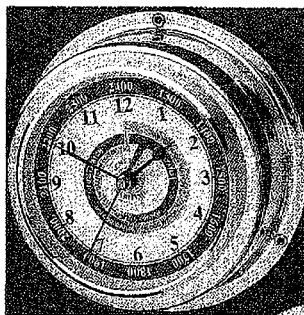


Photo D. Fellow home-brewer Ken N9HDX, unwinding after a long day of discussing projects.

Close in age, we shared many common interests which included science fiction and a wide range of technical topics, fuel for our rag-chews. He is a bit of an unusual character, and unconventional attitudes and thinking (to a certain extent on both our parts) led to interesting topics of discussion, and provided good "brain exercise." Years later, his mother commented to me that she was glad her son had a friend like me; I guess she considered me to be the most "normal" individual that her son socialized with. After we shared common laments about the things we put up with from him, she asked how we ever put up with him; my comment was, "Everyone else is too normal!" I'm glad we got the chance to share a laugh — I guess sometimes the truth can be as funny as the best joke.

Another noteworthy individual I met through my VHF activities was Roy W9FHS (who passed away in 1998). Both he and Joe had worked for Motorola as far back as World War II (Joe having retired in '76), and had the chance to be involved with, or at least be witness to, many of the developments in radio communications throughout those years. At one point, Roy sent two pictures of him — one as he was working on a test bench, and the other while he and Joe were about to take some amateur radio equipment for aeronautical mobile tests in what looked like a Piper Cub; the equipment they were testing was for 2-1/2 meters, then available to amateur radio operators. These were two other individuals I shared many long and interesting QSOs with, although seldom with the variety of topics being discussed as with my friend in Chicago. The unusual point about Roy was that he never wanted to be seen; whenever a ham offered to give him a ride to a hamfest, or to play chauffeur for whatever errands Roy needed run, or just to drop by for a social call, Roy always demurred. Roy was also known as "Mr. HT." Every time he spoke with someone, it seemed as though he would mention a new HT he had recently acquired; it was also general knowledge that Roy only used HTs.

Joe was active with tinkering after one fashion or another, well past his retirement in '76. He kept track of 220 MHz propagation, worked DX when it was available, in spite of having only indoor antennas, and was frequency coordinator for over ten years. Thanks at least in part to his efforts, 220 MHz operation in the Chicago area stayed as well organized (and some say as civilized) as it has been, even several years after he retired from active coordination. Several people helped Joe with coordination, since we had our outdoor antennas; initially, I think it was Ken (KA9BTJ/N9HDX); then, as Ken became less active, I helped out (even retyping the list on a computer, and distributing it on an as-requested basis), as did Dave KA9KWR, (another friend and fellow rag-chewer I met on 220, although Dave became active on 220 a few years after I had become established on the band). During his latter years, when his eyesight became less than ideal and hands weren't as steady as they used to be, Joe's home-brewing dealt mainly with the larger things that were easy to see and handle, like a dual-band 220 MHz and 440 MHz 5-element



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loop antenna and home-made duplexers for his repeater, made from coffee cans.

For smaller things like fixing microphone connectors, I was always glad to help out. In spite of the difference in our age, we became friends. He was very much like a favorite uncle until he passed away. Although our discussions usually centered on amateur radio, we had the chance for lunch get-togethers, trips to the odd hamfest, and barbecues at my parents' place. My mom and Joe's wife Emma became friends during that period of time. After Joe's passing, until her passing in March 2001, I was sure to always send flowers to Emma at Christmas, even through those years when my visits were infrequent.

There don't seem to be all that many hams left (if any!) willing to go to that extent for their home-brew projects as Joe did with his coffee can duplexers, although a few of us came close. In the early days of our friendship, Ken wanted to take along 220 MHz gear in the 1974 Mercury Comet I drove; all I was set up for was two meters and CB. I wanted to donate some World War II aircraft radios to an aircraft museum I had heard about in Michigan, as well as stop by a winery on the way back (in Paw Paw, Michigan) to pick up a few bottles to take home. We thought it would be the ideal time to test the range of a few of the Chicago repeaters out towards the east/southeast, a direction we didn't drive in too often, and if we got lucky even meet up with another well-known 220 MHz user and friend, Dennis KA8BND.

So, here's a rusty '74 Comet, already bristling with antennas for 144 MHz, 28 MHz, and the FM stereo (they were still external back in those days, instead of in the windshield — that came about five to ten years later), and Ken adds a 1/4-wave for 220. Ken's antenna consisted of the stiff household wiring used in the walls for household power, soldered to a bulkhead (SO-239) connector, and wedged in the passengers' side window. Whenever we accidentally keyed up 11 meters and 220 MHz at the same time, an under-rated fuse would blow under the dash.

Fortunately I knew which fuse, so all it cost us was a side trip to a Radio Shack. All those antennas on something that was obviously not an official test vehicle by any stretch of the imagination makes it surprising we didn't look suspicious enough to get pulled over.

Unfortunately we missed Dennis, but did get a tour of the 224.30 repeater site near Niles, Michigan, by "Doc," the system's owner, and had a pleasant visit with this 220 regular whom we didn't get the chance to talk to all that often. This took place at the beginning of a time when we would go on trips at the slightest excuse; Ken shared my interest in studying the range of our favorite repeaters (I was to continue this later, in a time when it became increasingly hard to gain Ken's participation in much of anything, due to his health situation). Either with a group of others or on our own, we would make trips to sites within a day's drive of Chicago (like the Oshkosh Aircraft Museum, and the architectural museum in Spring Green, Wisconsin). It was the one of few friendships in amateur radio that developed to include interests other than strictly radio communications, and extended to such diverse things as Halloween parties and laser-tag competitions at the local laser-tag establishment (which has since gone out of business, at least in this area).

The mention of road trips brings back memories of a business trip my dad took with our two meter portable (for those who might remember the old antique radios, it was an Icom IC-2AT). He favored 2-meter operation longer than I did, mostly from a practical standpoint way back then: there were still more repeaters on two meters than there were on 220 MHz, and he did a lot of traveling for business. He usually did more listening than talking, since he was never sure what to talk about on the radio, although in one particular trip when he was driving I had actually been able to convince him to transmit a bit. I was at the home station, and he was providing a commentary about his location, traffic, when he'd be back, and such, when his signals started to get noisy. In

order to keep talking for a few more miles, he ended up placing the HT on the roof of the car (both to get the ducky antenna outside of the shielding of the car's metal body, as well as to get a decent ground plane effect from the car's roof), using the speaker/microphone with his other hand, and steering the car with his left knee; all while doing the speed limit on the expressway. For a half hour or so following my dad signing out, all that the hams on that repeater could talk about was "the nut with the HT." (At least for a short time, this resulted in my not getting the standard lecture about what dumb stunts kids do.)

Some of the friendships in amateur radio can be considered unusual, in their consistency (longevity) or lack thereof. On the HF bands, due to the variabilities of propagation, it is often difficult to meet the same person twice with any consistent regularity, making the development of friendships at least mildly challenging. On VHF and UHF bands, though, much time is spent driving to and from work with basically the same group of people riding along with you, via radio. This usually happens long enough (and usually longer) to have acquaintances turn into at least mild friendships. Yet, people seem to come and go (some switching jobs, work times, or frequency bands; others move out of the area, or retire) without keeping in touch with friends left behind. By the time this phenomena had developed from a curiosity into some kind of cosmic ritual, I pointed this out to Dave (KA9KWR), mentioning that the situation seemed like we were the "regulars" on a television show and we're watching the comings and goings of the "guest stars." Some would even go so far as to say our antics qualified this as a comedy show, but more on that later. Maybe I'm being too sentimental or nostalgic, but occasionally it seems a bit sad to think a lot of the voices and conversations of the past long gone; the sentimentalist in me wishes that, way back when, when these conversations took place, I would've had the foresight to capture at least a few on tape.

Next time: Fun times, bedsprings, and flagpoles.

All About Electronics Frustration

Or, what to do when neighborly theory meets neighborly reality.

Hams get involved in some interesting and sometimes weird electronic projects. Have you ever had a neighbor walk up your driveway and hand you something electronic and ask you to repair it? Because hams are involved with electronic theory, techniques, and hardware, they're liable to be asked to repair most anything, but does it matter what the application might be for the device that's to be repaired?

One of my neighbors asked me to look at and repair, if possible, a pocket Panasonic RF-455 AM/FM broadcast radio as shown in **Photos A and B**. Normally the time required to diagnose and repair such a radio is very short, and of course believing that, I accepted the task.

Guess what? As you perhaps have already guessed, the task turned out to

be very time consuming. It wasn't that the circuit was too complicated, but the AAA cells had leaked inside of the case, causing corrosion and damage to the board circuit traces. At this point most hams in their right mind would return the radio as "not repairable." Well, either I'm gullible, out of my mind, or just curious about the challenge of a somewhat common circuit; I decided to see how far I could go in sorting out the problems. You see, it's always been my philosophy that if a device once worked, that it should be capable of working again.

Since the battery leakage had dried and was left as hard corrosion, chipping it off with an X-acto knife worked quite well. Once the board had been cleaned up, power was applied, and as expected, the radio failed to play. Originally, the circuit board had been coated with a green solder mask, but some had been undermined by the battery fluid, causing black corrosion along portions of the trace. Scraping the circuit trace lines with the knife revealed two obvious circuit breaks. These breaks were repaired by bridging them with wire jumpers soldered across the gaps. **Photos C and D**, respectively,

show the top and bottom sides of the printed circuit board. **Fig. 1** shows the parts placement and identification for the major parts on the board.

Applying power again to the radio created a new set of circumstances that led me down a serious troubleshooting path. With 3 volts applied, the radio failed to play. However, after decreasing the voltage to 1.7V, the AM radio

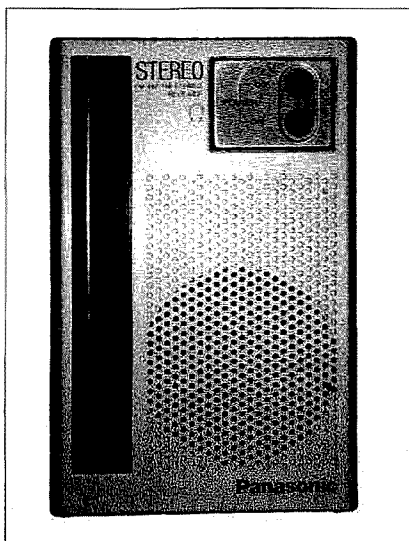


Photo A. Shown is the front face of a Panasonic model RF-455 broadcast AM/FM-STEREO pocket radio.

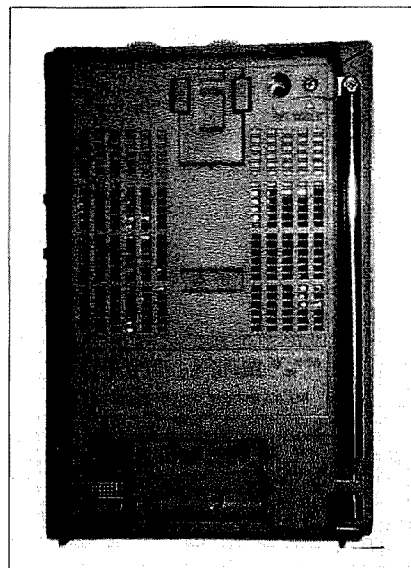


Photo B. Shown is the backside of the Panasonic broadcast radio.

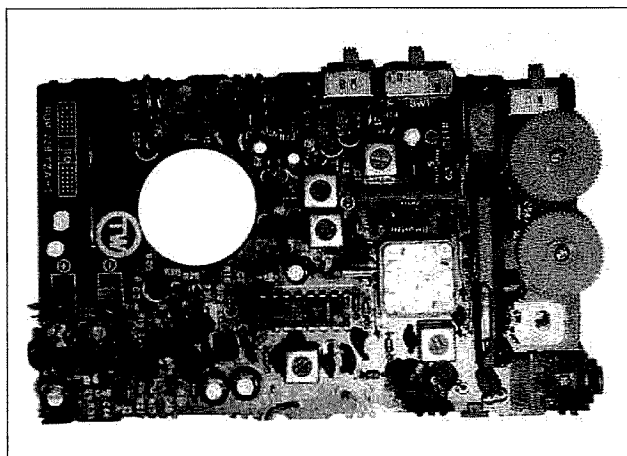


Photo C. The component side view of the printed circuit board.

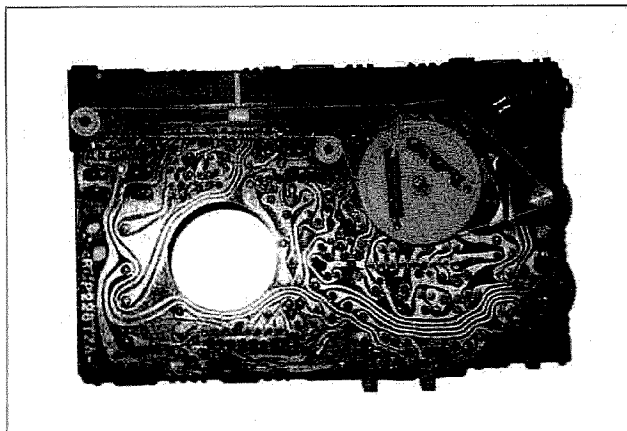


Photo D. The bottom side of the circuit board. Circuit traces were damaged by leaking battery electrolyte.

showed signs of life, though poor. After operating for a while, the sound would fade away as if the supply voltage was being reduced. Raising the voltage above 1.7V caused the sound to stop as well — so where to go next?

At this point I concluded that I needed to know more details about the circuit than what I could view by looking directly at the circuit board. Correct, I wasn't familiar with the ICs used on the board, so they provided a level of unknown. Therefore, some logical troubleshooting technique was warranted. This step required a schematic, but where does one get a schematic? After an Internet search for either a schematic or data on the ICs used, the only thing available was data on one of the three ICs. Believe it or not, that's the one IC that appeared to be working properly. Therefore, the only avenue left open to me was to trace the circuit and draw out a schematic. Tracing and drawing the circuit took some time, but a sufficient amount of the circuit was developed to

enable my understanding of what was going on in order to troubleshoot the circuit.

Since IC data except for one chip was unavailable, pin functions for the two unknown chips left a lot to be desired. The signal path information developed through the circuit tracing allowed me to assume circuit path functions for most of the IC pins. From my circuit tracing, the combined block and schematic diagram was developed and is shown in Fig. 2. Circuitwise, the radio is made up into sections, with IC1 being the FM mixer/oscillator feeding a 10.7 MHz signal through a ceramic filter into IC2. IC2 is a complex device in that it contains the AM oscillator and mixer in addition to the 10.7 MHz IF and FM quadrature detector. A detected DC voltage level from the detector circuit is used to

drive a varactor diode used for AFC of the FM oscillator.

The detected audio output, which also contains the FM multiplex signal, is routed to IC3. IC3 is made up of the stereo multiplexer, two preamp audio channels and the stereo lamp driver. Output audio from each preamp is fed through individual volume controls mounted on a common shaft to drive two individual discrete transistor amplifiers. One path is used for both AM and monaural FM audio, and the second path is used for the second audio channel during a stereo broadcast. Because of the interesting design used in the two audio amplifiers, I've shown them in Fig. 3. There are slight differences between the two circuits, and both are shown instead of one to represent both. These amplifiers operate from a 3-volt battery and provide an

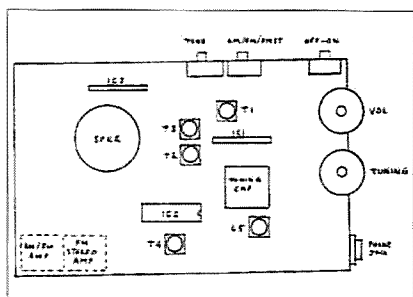


Fig. 1. A drawing showing the placement and identification of the major components.

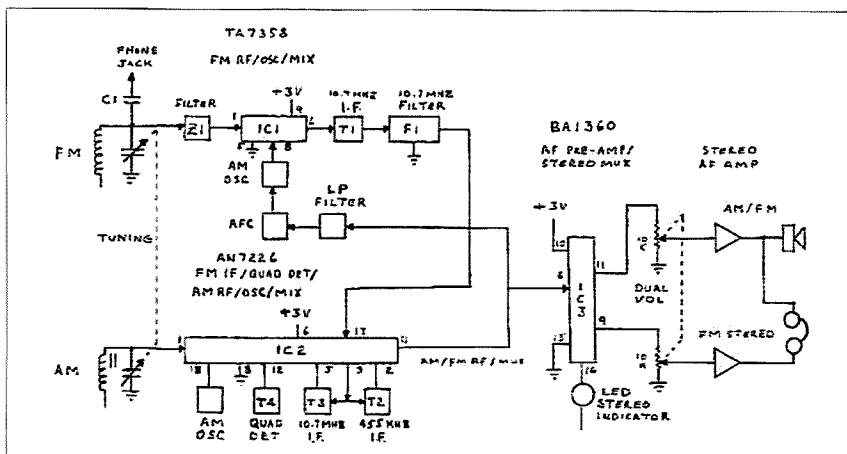


Fig. 2. This is a combination signal path diagram and partial schematic with IC pin numbers identified.

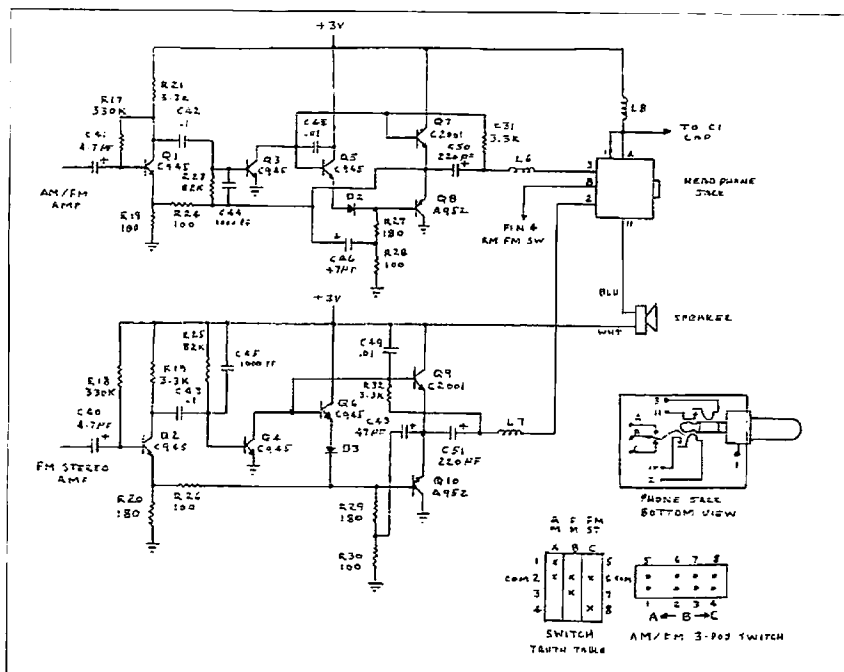


Fig. 3. Shown is the schematic diagram of the discrete audio amplifiers. Included is a pictorial view of the phone jack and internal switching arrangement. Also shown is a truth table identifying switch pin positions for the dual three-position AM/FM selector switch.

audible signal level that seems to be quite adequate for a small handheld radio. I would have to conclude that the power drawn from the battery is minimal but varies directly with the desired volume level. At least with my hearing capability, there is no detectable distortion in the audio until the speaker cone strikes a travel limit.

Of importance during troubleshooting is the identified signal path and the associated IC pin. To obtain a reasonably accurate schematic, it was necessary to remove the dial assembly, AM/FM selector switch, and the stereo headphone jack. Detailed information on both the switch and headphone jack is

shown in Fig. 3. The stereo headphone jack was interesting in that I hadn't seen one previously that contained three switches and the only way I had of interrogating it was to remove it from the board. You'll note that the AM/FM switch is a dual three-position selector switch, with pins 2 and 6 being independent common wiper pins.

The slide-rule dial assembly had to be removed to obtain access to the bottom side of the circuit board, otherwise it would have been better to leave it in-place. On a cautionary note, a Circlip (or "E" clip) is used to hold the dial's tuning shaft in place. The clip must be captured during removal or it

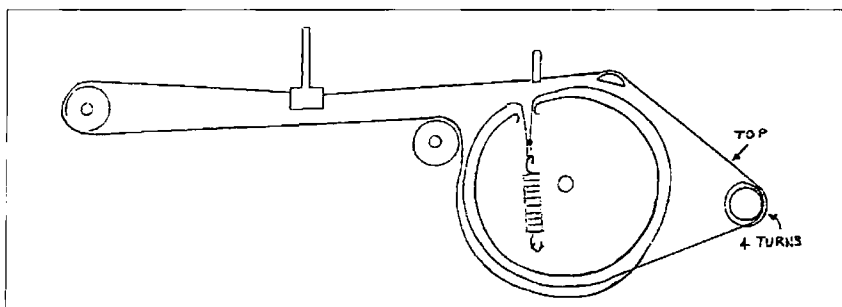


Fig. 4. This is a drawing showing the dial cord routing including the correct orientation of the tuning capacitor's pulley.

will be lost forever (biblical terms are usually expressed as the clip goes flying away). Fig. 4 shows the dial string configuration. Yes, I certainly needed the diagram during the re-assembly process.

Equipment required for troubleshooting is: a voltmeter, signal generator, and a receiver tuned to 10.7 MHz. The first step in troubleshooting was to check the FM mixer-oscillator to determine if signals were passing into the IF path. The receiver was connected to the output of the 10.7 MHz IF ceramic filter, and signals were present and tunable indicating the front end was operating correctly. With the front end operating, the next step was to determine if the 10.7 MHz IF and quadrature detector were operating. At this step I ran into an interesting set of circumstances. At first, the IF/detector failed to operate. However, after raising the generator's signal output

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Pin #	TA7358	AN7226		BA1360
	IC1	IC2		IC3
		AM	FM	
1	0.71	3.0	0.52	1.01
2	1.45	3.0	0.52	0.04
3	2.9	3.0	0.52	0.04
4	1.41	0.71	0.55	0
5	0	2.5	2.67	0
6	3.0	2.55	2.81	0
7	2.16	2.20	2.80	1.36
8	2.88	0	0	3.0
9	3.0	1.67	2.28	1.41
10	—	1.28	0.39	1.07
11	—	0.01	0.01	1.38
12	—	2.36	2.31	1.0
13	—	2.33	2.0	0.05
14	—	0	0	1.01
15	—	2.51	2.64	0
16	—	2.51	2.62	1.37
17	—	2.51	2.63	—
18	—	3.0	0.52	—

Table 1. Shown are the voltage readings taken at each IC pin using a high impedance digital voltmeter. At the time of measurement the supply voltage was 3.0V.

Travels with Henryk — Part 10

Lithuania: “elementary essence of our hobby.”

It is a small country, exactly in the middle of Europe, at least according to the French Geographical Society. Tucked away on the eastern coast of the Baltic Sea, between the Russian province of Kaliningrad (UA2F), Poland, Belarus, and Latvia. Lithuania is similar to Ireland in respect to land area and population figures. It is also a green, agriculture-dominated country. But amateur radio activity is definitely higher in Lithuania. There are also tens of active radio clubs in LY-land. I visited two of them.

The capital city is Vilnius, and there I found a well-equipped club in The Youth Technical Creativity Center. The callsign is LY1BZB but sometimes they use the shorter contest callsign LY8X. The shack is prepared for multi-operator efforts (**Photo A**). The roof, from which I had an impressive view over the whole city, is armed with HF and

VHF radiating arrays (**Photo B**). Maintenance of some of these antennas is not easy (**Photo C**), as the building is more than 100 ft. high and balancing on the edge is risky. The larger part of the club's equipment and measuring instruments is bulky and obsolete (**Photo D**), but they do have a few modern-technology items. However, an average income is still low here and

new equipment is not affordable by everyone. This club welcomes mainly younger people who are attracted by our hobby. There are other departments in this Creativity Center, covering most technical hobbies like building aircraft models, go-carts, or computers.

On a more advanced level of technical knowledge and of more mature age are the members of the radio club at the



Photo A. The radio room at LY1BZB club. From left: Viaceslav LY1FF, Ernest LY3PH, Roy LY2BKF. (Photos by Henryk Kotowski SMØJHF)

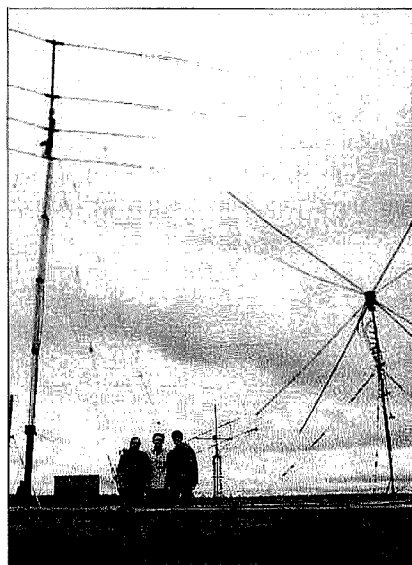


Photo B. The roof of LY1BZB club with HF antennas up front.

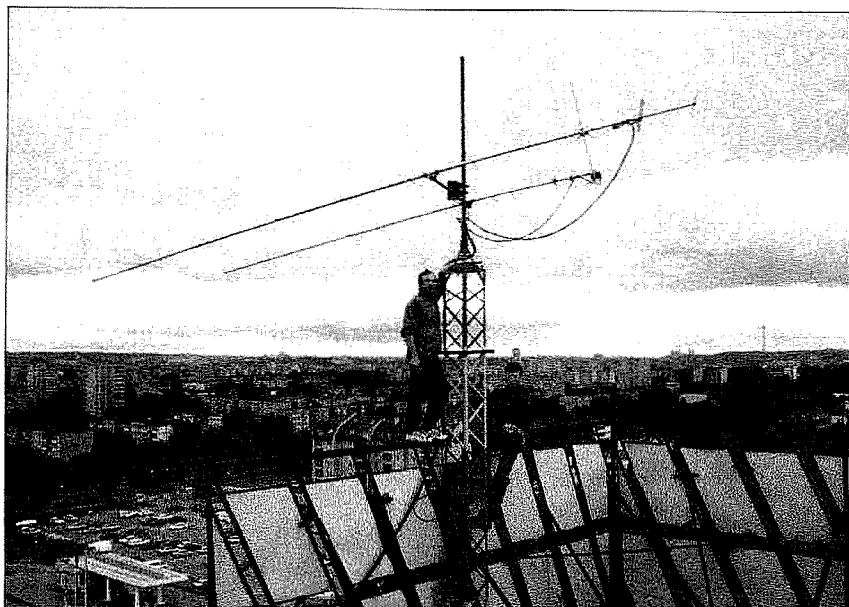


Photo C. At the roof of LY1BZB radio club in Vilnius, Roy LY2BKF, and lower, Ernest LY3PH.

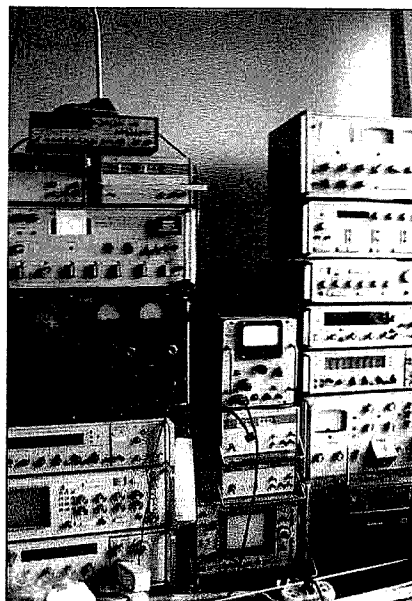


Photo D. Some measuring instruments of LY1BZB radio club.

Kaunas University of Technology. Their Web site is at [<http://www.ktu.lt/radio/>]. Out of nearly 100 members, students and graduates, teachers, and researchers, I met only two. When I met Ricardas LY2FN, who

lives in Kaunas, second-largest city of

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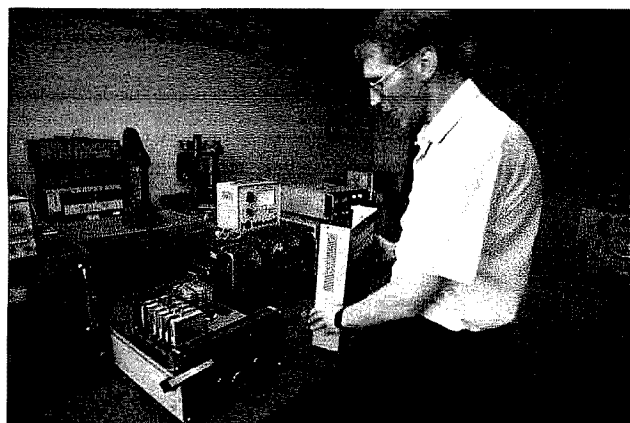


Photo E. Ricardas LY2FN shows his homemade HF transceiver.



Photo F. Ricardas LY2FN at the club LY2ZO displays power tubes commonly used by amateur radio operators in this part of the world.

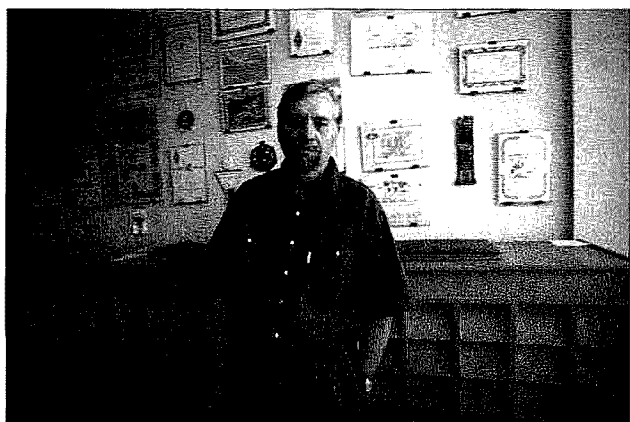


Photo G. Algis LY2NK in the Kaunas University of Technology radio club LY2ZO.



Photo H. Algis LY2NK at one of the contest operating positions out of town at the LY7A site.

Front and Center

How to use your computer to make personalized front panels.

By using a "word processing" approach, you can personalize your next project and have it "stand out from the crowd." Using readily available technology and a little imagination, you will be able to create a distinctive "panel cover" to complement your next creation!

There's always a project brewing on my bench, and as often as not, I'm anxious to "see" what the final appearance will be. This is usually the case long before all the "bugs" are worked out of the design. How many times have you placed a control on the front panel only to find it is in an *impossible location* when it comes time for labeling the front

panel? The style and size of control knobs play a big part in where the labels are placed, what size they should be, etc. Wouldn't it be nice to be able to add "special effects" to have your project be more appealing to look at? It is my goal to create projects that not only work as required, but are pleasing to look at.

The outer dimensions of projects

today are generally smaller than in days gone by. This size difference can be a problem! The "tape writer" or "rub-on" lettering isn't the correct size, and is often difficult if not impossible to apply. It sometimes just doesn't look good when you're finished. Today's computer technology has given us a way to create front panel "labels" that are easy to create, look great, and can be reproduced either in whole or part for future projects.

My computer uses Microsoft Word 2002® as its word processing software with Microsoft XP Professional. For those of you who are less computer-literate than I (and there aren't many of those around anymore!), you will need to "turn on" the following options if they aren't activated already. Located in the top menu bar, click on "View," then click on "Rulers." This will activate rulers on the top and side of your screen. Next click on "View" again and select "Standard, and Drawing" tool bars. The *Standard* toolbar is located at the top of your screen and displays icons such as "print, save ABC, etc." The *Draw* toolbar is at the bottom of the screen and has "AutoShapes,

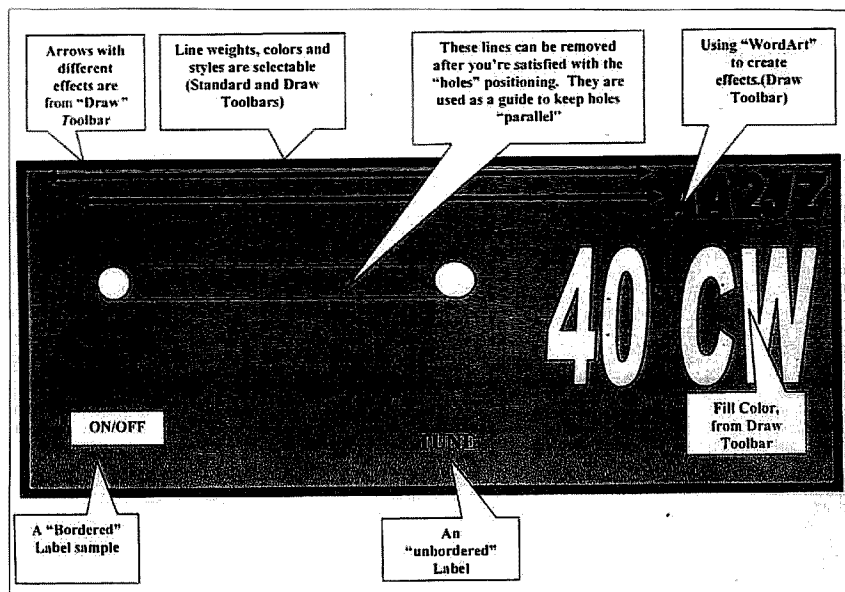


Fig. 1. Typical Word layout face plate.

lines, arrows, etc.," located on it. Either of these toolbars can be moved to other locations you may find more convenient. I happen to work with them in these locations.

Begin by measuring the face plate material, make note of the length and width. Don't forget to measure where needed holes are to be drilled. A rough, hand-drawn picture on scrap paper will suffice at this point. Then, on a blank, open "Word" document, create a "Text Box" from the "Draw" toolbar by clicking on the "page" icon (a square with lines on it representing a printed page). Make the rectangle slightly larger than the measurements of the blank face plate. Use the Ruler at the top and side of the screen as a guide. The excess paper will be trimmed away later when the finished print is adhered to the face plate material.

Now the fun begins!

Select the "slanted A" (WordArt) from the Draw toolbar, choose the first example in the upper left corner of the menu, set the type size to 18, and type your call. When you're done, select OK. The open-faced capital letters should have appeared somewhere on your Word document. It can be moved to your beginning panel by left clicking on the WordArt to bring up the "handles" (little squares) and dragging the WordArt to where you desire it. Those handles allow the work to be stretched, skewed, moved, rotated, etc. If you aren't pleased with what you've added, on the Standard toolbar are two curved, pointed arrows. Click on the left one and your last attempt is removed, while clicking on the right one will put it back. Key strokes can be removed or replaced in the order in which they were created, until the file is saved. What you've created should resemble the drawing in Fig. 1, with your callsign of course!

The neat thing about using a Word program to design a front panel face is that none of it is permanent until you want it to be. Go ahead, move things around, try different lines and shapes! The file you create is limited in design only by what you try. Having trouble

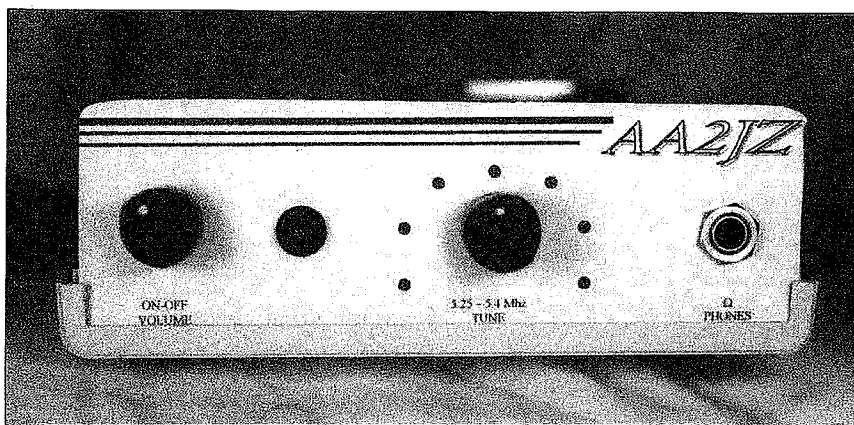


Photo A. 5.25–5.4 MHz receiver project. The case is a "left over" computer item. The word processing approach to faceplate design dresses it up just right.

making the "holes" for the controls line up? Draw guide lines using the "lines" option from the Draw toolbar. They can be deleted later. Fill color can be added to different portions of the drawing using the "spilling paint can" command from the Draw toolbar. Lettering colors can be changed by using the Font color command from the Drawing toolbar. There are many things that can be controlled from the toolbars: centering the lettering, changing the border line colors, etc. The manual that came with the computer will list them. Unless of course, your computer is like mine and is minus the manual. In this case, you just have to play (design) and try things out!

Let's assume that you've put together

a design you find attractive for your project. Print a copy of your design. Now, while holding it against the blank face plate, make sure that the layout is correct. By this, I mean that the hole locations are where they should be, that the lettering will fall in the proper place. I said to make the overall size of the print slightly larger than the measurements of the blank face plate. I do this to ensure that the design I created will fill the entire length and width of the plate, and that the callsign or other design will have some space at the end and not run off the end of the plate.

Printing the first few tries on plain

Continued on page 58



Photo B. The panel slips into slots and the top snaps over it all to keep it together.

NEVER SAY DIE

Continued from page 8

Van Allen

The Van Allen radiation belt, originally predicted and described by Nikola Tesla, protects us from high energy radiation from the Sun. Okay, so what's the big deal? We're shooting astronauts into Earth orbit all the time. Some even stay there for quite a while in the space stations.

The big deal is that all of this activity is going on hundreds of miles up, not thousands, where they'd have to deal with the intense radiation in the Van Allen Belt.

One mission did get up around a thousand miles, where the Van Allen Belt is just barely starting, but they reported seeing intense light flashes in their heads resulting from the radiation and had to quickly be brought down to a lower altitude.

Bart Sibrel reported on the C2C show that he asked one of the men who supposedly went to the Moon about seeing this phenomenon while passing through the Belt. No, he'd seen nothing like that. None of the Apollo astronauts reported anything like that. This further convinced Bart that the Moon missions had been faked.

Bart's the guy who got socked in the jaw when he asked Buzz Aldrin to swear on the Bible that he'd actually been to the Moon.

More Moon

A ham friend who worked for NASA in the '70s explained why the engineers at NASA during the Apollo missions had to use slide rules for their orbital calculations. The computers NASA used in the Apollo days were surplus fire control computers—30 bit machines with 32 kb of memory. That's kilobytes, not gigabytes.

What fantastic luck to be able to get all those missions to the Moon and back safely with slide rules and a black board for calculations.

WA6VPS Rides the Airways Again?

One of our most famous brethren, Kevin Mitnick WA6VPS, is getting his ham ticket back!

Mitnick, "the most wanted computer criminal in U.S. history," says he's spent over \$16,000 in legal fees to get his ham license back. He claims this is the most expensive ham license in the world. When you hear him on the air be sure you do your best to give him his money's worth. None of this stupid "the rig here is..." crap. Ask him about himself.

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Key was on with Art Bell W6OBB on one of Art's final C2C broadcasts. It was nice hearing from the subject of so much furor. I only wish the interview had been more interesting. Zzzzz.

Ooops!

Your friendly drug companies and the FDA goofed again, killing a lot of customers. This time all drugs containing phenylpropanolamine are being recalled. Seems the stuff has been causing strokes and seizure in children and in particular with women in the 18-49 group.

The stuff is in Acutrim, Alka-Seltzer, BC, Comtrex, Contac, Dexatrim, Dimetapp, Robitussin, and Triaminic products, so check the fine print on the labels carefully. You can probably get a refund.

If you'd keep your immune system in shape you wouldn't need any of this junk anyway. Remember, every drug has side effects, it's just that most aren't this serious. Or they haven't found out that they are yet.

Oklahoma

A letter from a reader says he talked to a nearby seismograph operator a few days after the bombing. He said there were two distinct tremors recorded about nine seconds apart. The government explanation was that the second tremor was from the impact of the building coming down. Later, when the remaining building was brought down by a controlled detonation there was no tremor recorded, even though there was about five times the tonnage this time.

I've copies of the TV news broadcasts of the bombing available for \$10 (Radio Bookshop item #53). It shows interviews with several of the building's occupants testifying that the first explosion was inside the building, and the truck bomb went off a few seconds later. It also shows bomb squads removing two unexploded bombs from the building.

There are suggestions that McVeigh wasn't really executed, but is living comfortably somewhere with a new identity.

Money Talks

One of the biggest mysteries in Washington is who inserted a two paragraph rider in the homeland security bill which confers virtual immunity to drug makers against any vaccination suits. The suspected culprit is the mercury-based preservative used in vaccines for diseases such as mumps and measles. Hundreds of parents have sued the drug manufacturers for including mercury in their vaccines after their children have been diagnosed as autistic.

I read that in 2002 Eli Lilly alone gave

\$1.6 million, mostly in cash, to GOP political candidates. Their investment clearly paid off. The Democrats failed their biggest contributors ... trial lawyers.

The Warming Crock

The ignorant and misinformed are still making a stink about global warming. They're anxious to implement the Kyoto Protocol, which would cost us at least \$500 billion a year and virtually destroy many third world nations.

Warming? Historically today's temperatures are cooler than their average during the human era. The record shows that the world was several degrees warmer 1000, 3000 and 6000 years ago, long before we started burning coal and oil.

Hmm, 3000 and 6000 years ago were when Planet X may have swished by. That should warm things up for sure.

I've been pooh-poohing global warming for years and until I see some reliable evidence to the contrary I'm going to keep at it.

Older Workers

As an employer my experience with hiring older workers was that it wasn't worth it. The lure is that they've experience and therefore should be able to do a better job. The reality was that in the businesses I've been in things were constantly changing and older workers resisted change. I did far better when I hired young people and trained them.

Kids are taught to get an education, get a job that will provide security, and eventually retire ... life's earned vacation. Few youngsters even consider any other route.

More and more companies are beginning to wise up that older workers have gold bricking down to a science and, when revenues start dropping, early retiring them. This gets rid of the employees who've built up salaries through yearly raises. Workers over 45 are discovering that there are very few jobs open for them.

My recommendation: even if you totally believe in a job and job security, give some thought to developing some sort of home-run business on the side. Maybe a mail order business. Then you'll have a cushion if your employer downsizes or goes out of business.

Indian Casinos

Time did a 13-page article on the Indian casino scam. Let me quote: "Imagine, if you will, Congress passing a bill to make Indian tribes more self-sufficient that gives billions of dollars to the white backers of Indian businesses —

and nothing to hundreds of thousands of Native Americans living in poverty. Or a bill that gives hundreds of millions of dollars to one Indian tribe with a few dozen members — and not a penny to a tribe with hundreds of thousands of members. Or a bill that allows select Indian tribes to create businesses that reap millions of dollars in profits and pay no federal income tax — at the same time that tribes collect millions in aid from American taxpayers. Can't imagine Congress passing such a bill? It did."

And we're the patsies paying for all this. A tax cut? Har-de-har.

Cancer!

Si-i-i-igh. A five-page article in *Business Week* on cancer was all about traditional treatment. Well, they're certainly not going to take even a slight chance of offending the pharmaceutical industry. There was no hint of what's causing cancer. No hint that there are any treatment alternatives.

Since no consumer publication dares to challenge the medical industry, FDA, drug industry, HMOs, and the parasitic sickness insurance industry, the only way the word is going to get out is for you to tell anyone who will listen that cancer is easy to cure. Any cancer. And with no drugs. No chemo. No radiation. No surgery. And I mean cure, not remission!

This veil of secrecy has been killing millions of people.

No, I'm not an MD. Hell, if I was I wouldn't dare make such a statement ... I'd lose my license in a wink. But I do believe in the work of Drs. Lorraine Day, Bruno Comby, Henry Bieler, and a bunch of others who are never mentioned in the medical schools or medical press.

It's all explained in my *Secret Guide to Health*.

Over half a million Americans are dying every year of cancer. And when cancer strikes, the victims learn soon enough that it's incurable ... that the best they can hope for is remission. What a crock! But not one in ten or a hundred thousand will ever make any effort to look into the situation and do any research. The public's belief in doctors is almost total.

If any cancer victims you meet don't even want to look at my book, maybe you can get them to call 800-574-2437 and get Dr. Day's video, "Cancer Doesn't Scare Me Anymore!" Yes, she's a "real" doctor.

With the medical cabal making an average of \$345,000 per cancer case, news of how easy it is to totally cure any cancer with no drugs could cost the industry hundreds of billions.

Didja see the "50 Minutes" segment

where an AIDS patient was spending \$6,000 a month for a drug that made her feel better? I sure wish someone would clue her in that AIDS is as easy to cure as cancer. Dr. Comby in Paris has been doing it for years using the same raw food approach as Dr. Day, as explained in my book.

The American Cancer Society

One of the guests on the Art Bell show pointed out that of the \$400 million they get a year, less than 5% goes to patient care. 61%, he said, goes for salaries and perks. Further, they've never made one single advance in the treatment of cancer.

We have the spectacle of Dr. Lorraine Day easily curing her "incurable" cancer. Ditto Dr. Bruno Comby and a few other renegades. And Dr. Henry Bieler curing one child with "incurable" leukemia after another.

A hundred years ago cancer was almost unknown in America, but the American diet then was totally different. We were a country of farmers, eating home grown potatoes, tomatoes, grain, raw milk, free range chickens and eggs, and almost no sugar by today's norm.

Cancer has gone from a rarity to causing one out of three deaths by 1985, one out of two now, and it's projected to reach everyone by 2020.

Maybe you can start getting the word out about how easy cancer is to cure as long as people don't fall for the medical industry \$345,000 chemotherapy or radiation to death routes — and how easy it is to prevent in the first place with a saner diet.

Mercury

Dentists who have been using dental amalgam for fillings were found to have four times the normal level of mercury in their bodies by researchers at the Glasgow Royal Infirmary. They also had more kidney disorders and memory problems. My dentist, who helped load my mouth with mercury (since removed), died of Alzheimer's.

And this is the stuff that, as a child, I played with and used to coal dimes. It turns out that its vapors are easily inhaled, and it also migrates through the skin to your brain. It takes from 15 to 30 years for half of it to leave your body.

It's been found to cause Alzheimer's, kidney dysfunction, multiple sclerosis, food allergies, impaired immune system, fatigue, poor memory, and psychological disorders. Mothers with mercury poisoning can expect birth defects in their children.

Yet, with all this becoming common knowledge, many dentists are still using amalgam fillings and denying the long range health danger.

If you still have any amalgam fillings, get 'em replaced with plastic as soon as you can.

Tora Bora

Wow, we're semi-famous! D'ja see the report of a copy of 73 being found in one of the Taliban caves in Tora Bora, Afghanistan? Gee, I wonder if our guys killed my subscriber?

Senior Hams

Well, if we can't attract the kids, then how about going after the geriatric generation?

Maybe you've read that older people are stressed by their isolation. If I had to depend on friends my age around here, I'd be stressed too. Most of my old friends are dead. John Peterson, who I used to go hunting and skiing with, died last year.

When you have a ham station you definitely are not isolated. All I have to

Continued on page 62

Scrambling News

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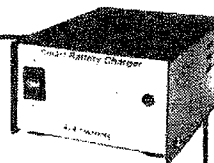
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CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Calendar Event.

MAR 1

KNOXVILLE, TN The Shriners of Kerbela ARS will sponsor their annual Kerbela Hamfest at Kerbela Temple, 315 Mimosa Ave., Knoxville TN. Admission is \$5. Indoor vendor tables are \$8 each plus admission of \$5. Setup Friday from 4 to 8 p.m., and Saturday from 5 to 8 a.m. Overnight security will be provided. Talk-in on 145.43 (-600), or 146.52 simplex. Smoking indoors is permitted in designated area only. Contact *Paul Baird K3PB, 1500 Coulter Shoals Cir., Lenoir City TN 37772. Phone 865-986-9562.*

MAR 8, 9

CHARLOTTE, NC The Mecklenburg ARS proudly announces the 2003 Charlotte Hamfest and Computerfair. It will be held at the Charlotte Merchandise Mart, 2500 E. Independence Blvd. (US 74), Charlotte NC, on March 8th and 9th. Commercial dealers will be in Freedom Hall. The flea market will be in Independence Hall. Doors open 8:30 a.m. to 5 p.m. Saturday, and 8:30 a.m. to 2 p.m. Sunday. All the top manufacturers will be represented. Major equipment dealers, tons of great prizes, VE exams, ladies' programs, forums, new and used radio and computer equipment. Meet FCC's Riley Hollingsworth and a NASA shuttle astronaut. Tickets are \$8 at the door for both days, \$6 in advance or for just Sunday. Kids 12 and under admitted free. Flea market tables at \$22 each are good for both days. Pre-paid parking \$3, good for both days. Talk-in on 145.29 W4BFB rptr. For more details check the Web site at [www.w4bfb.org], or call *Tom Hunt KA3VVJ, 704-948-7373*. Dealers may E-mail to [dealers@w4bfb.org]. For table reservations E-mail to [fleamarket@w4bfb.org]. Pre-registration tickets and table orders may be sent to *Charlotte Hamfest, P.O. Box 669, Cornelius NC 28031-0669*. Be sure to include an SASE!

MAR 9

AMHERST, MA The M.T.A.R.A. 18th Annual Amateur Radio Hamfest will be held Sunday, March 9th at Amherst Regional Middle School, 170 Chestnut St., Amherst MA. Directions: From Mass Pike Exit 4: take Rte. 91 North to Exit 19, Rte. 9. Take Rte. 9 to Amherst Center. At the light in Amherst Center take a left. Proceed through several lights, pass Bank on right (just past the bank). Turn right on
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Chestnut St. (not Chestnut Court), and proceed to Amherst Regional Middle School on the left. There will be help unloading and loading. Tailgating, no stairs, handicapped parking, a snack bar, and 120 VAC available. Doors open 7 a.m. for vendors, 9 a.m. for bargain hunters. Admission \$5 for adults, children under 12 free. Tailgating \$5, 8 ft. tables \$15 each. VE exams at 10 a.m. Space limited, pre-registration strongly recommended. To register, contact *Dave Cote WA1DC, [wa1dc@arrl.net]*. Bring two forms of positive ID, with originals and photocopies of any CSE's you hold. If licensed, bring your original license and a photocopy. Walk-ins will be accepted, but only as seating permits! For commercial license testing, GROL, GMDSS-O/M, ship radar, etc., contact *Steve N1SR at 413-593-6554*. Leave name, phone number, and desired license. Talk-in on the 146.940 MHz Mt. Tom rptr. and KD1XP's rptr. 145.130 MHz PL 123.0 Hz.

MAR 15

SCOTTSDALE, AZ The Scottsdale ARC will sponsor a hamfest starting at 6 a.m. on March 15th at Scottsdale Community College, 101 North - exit Chaparral Rd., 9000 E. Chaparral Rd., Scottsdale AZ. Parking \$2. Tables \$10. Self contained RV parking. VE exams. Refreshments. Talk-in on 147.18. Contact *Ed Nickerson WU7S, 902 North 73rd Place, Scottsdale AZ 85257. Phone 480-949-5162. E-mail to [enlckerson427@aol.com]*.

MAR 16

JEFFERSON, WI The Tri-County ARC will host "Hamfest 2003", Sunday, March 16th, at the Jefferson County Fairgrounds Activity Center, Hwy. 18 West, Jefferson WI. Open to the public from 8 a.m. until 1 p.m. VE exams start at 9 a.m. Vendors will be admitted at 7 a.m. Vendors-only parking will be provided for unloading. Food and beverages will be available. Talk-in on the 145.49 rptr. Admission \$4, 8 ft. table space @ \$6 each. Reserve your space early! Contact *TCARC, 213 Frederick St., Fort Atkinson WI 53538. Call 920-563-6381 evenings. Fax 920-563-9551. E-mail [tricityarc@globaldialog.com]. The Web site is at [www.cmdline.com/tcarc/]*.

MAR 22

BRAMPTON, ON, CANADA The Peel ARC

and Mississauga ARC will host a hamfest on March 22nd at the Brampton Fall Fairgrounds. Take Hwy. 410 north until it becomes Heart Lake Rd. just past Bovaird Dr. Continue northward 7.5 km (4.6 mi) to Old School Rd. The fairgrounds are on the southwest corner. This event will feature amateur radio equipment manufacturers, major commercial vendors, new and used radio/computer electronics equipment and parts, VE exams, DXCC card checking, seminars, exhibits and demonstrations. There will also be a gala banquet and prizes. Guest speaker will be Jim Dean, VP, Radio Amateurs of Canada. Doors open to vendors at 7 a.m., and to the public flea market 9 a.m. to 1 p.m. Exhibits, demonstrations and seminars will be presented 9 a.m. to 5 p.m. Admission \$C 6; vendor tables \$C 25 and \$C 30 (6 ft. and 8 ft.). Includes one free admission per table. Talk-in on VE3PRC 146.880(-) and VE3MIS 145.430(-). Check the Web site at [<http://www.peelarc.org>] for more info. E-mail to [ham-ex@sympatico.ca]. Phone *Victoria 905-846-0822*.

MAR 23

MADISON, OH The Lake County ARA will be holding it's 25th annual Hamfest/Computerfest on March 23rd, from 8 a.m. until 2 p.m. at the Madison High School, 3100 Burns Rd., Madison OH. Great bargains on new and used amateur radio equipment, computer and various other types of electronic equipment. There will also be hourly door prize drawings, craft demonstrations and VE exams. Admission tickets are \$5 and may be purchased at the door. Tables are \$8 each for 6 ft. or \$15 for two 6 ft. tables; \$10 for an 8 ft. table. Call *Roxanne at 440-209-8953* for table reservations, or E-mail her at [roxanne@lcarc.org] for any other questions.

MAR 29

ST. PAUL, MN The Robbinsdale ARC, Inc. will hold their Midwinter Madness® Hobby Electronics Show Saturday March 29th from 7:30 a.m. to 1 p.m. at Ganglehoff Center, 235 Hamline Ave., on the Concordia University Campus in St. Paul MN. Concordia University is located off Interstate 94 near Hamline and Marshall. Midwinter Madness has commercial vendors selling new items in the line of

Continued on page 59

Continuing Education: Emergency Communications on the Go

In many professions, there is a requirement to participate in continuing education in order to maintain your certification or license. In amateur radio we are also engaged in a dynamic technology, and there are certain benefits to continuing our education in our hobby as well.

My professional field is in radiology, and although I have been in the management end as opposed to the clinical arena for many years, I keep my license and national registration current in both radiography and magnetic resonance imaging. This means that I must complete a minimum 24 hours of approved continuing education every two years to be able to maintain my status as a Radiologic Technologist. (Trivia note: Since the early 1950s the correct title has been Radiologic Technologist. People who refer to X-Ray Technicians are over a half century out of date.) On one hand, it might be argued that with nearly thirty years in the field my experience should be fairly extensive and I should have a pretty good understanding of it. On the other hand, during my career, healthcare has added Computerized Tomography (CT or CAT Scan), Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET Scan). The requirement for continuing education has ensured that I stay up-to-date in my own clinical areas, as well as learn about the new and emerging technologies.

Amateur radio is also a technologically oriented field with many enhancements over the twenty years that I've been licensed. While the International Morse Code hasn't changed, we've added many new modes, particularly in the digital realm. The brick-size handie-talkie that my Elmer used has given way to much smaller multiband computerized HTs with more features than I could have imagined back in the early '80s. I remember amazing people by bringing up a phone patch with my first HT. Today that would only rate a yawn, but only if I could get the other person to put their cell phone down for a minute or two. The world and our hobby have changed phenomenally, and that's why we're beginning to see a

movement toward continuing education in amateur radio.

The American Radio Relay League is the driving force behind this movement. Whether you love the League or hate it, you have to admit that they have given the hobby some tools that we otherwise would never have enjoyed. Continuing education is one such offering. While many hams read voraciously to keep up on the great new technology (known to our spouses as toys), there is something to be said for a structured approach to learning. A structured educational process attempts to ensure that certain topics are presented in a certain way so that the learner acquires certain skills or concepts that may not have been present before. Pilot's training, for example, is geared to teaching the student all the skills essential for a safe flight under routine conditions. It also provides a framework so that others engaged in the same endeavors have a reasonable idea as to what others' level of training is. It kind of lets you know what to expect when dealing with someone new if you know what training they've had.

With the state of the world today, one of the key sets of skills that amateur radio operators can be expected to have are those relating to emergency communications. With as near and dear as this topic is to my heart, I think it was an excellent idea for the ARRL to offer this as a continuing education course.

There are actually three courses on emergency communications that the ARRL offers. The first course is aimed at amateur radio operators who expect to be called upon to provide communications in an emergency. The Level II course develops net management skills for those who want to participate as net control stations and net managers. The third level is aimed

at those who manage emergency communications at all levels.

I had the opportunity to take the Amateur Radio Emergency Communications Level I over the past few weeks. The course is handled on line through the Connecticut Distance Learning Consortium, and is kind of like going to school over the Web. To enroll in a course, you can go to the League's home page [<http://www.arrl.org>] and search for AREC. Or you can go directly to [<http://www.arrl.org/cce/courses.html>], which will give you a description of each course and enrollment information. There is a cost associated with the courses, although all materials are provided via the Web. Each level of the course costs \$45 for ARRL members and \$75 for nonmembers. Upon submission of your application and fees, you'll receive instructions by E-mail on how to access the Web site and how to start the course.

Each student is assigned a mentor who will help him through the course. Mine, Jim Stalzer WJØS, provided guidance, insight, and encouragement during the process. In my case the course began in mid-November, and radiology has a major weeklong trade show that starts the weekend after Thanksgiving. When he didn't see the activity that would be expected, he gave me a gentle nudge to make sure that I was on schedule. The mentor is a key element to this course and its success, acting more as a guide and sounding board than an instructor.

There are twenty learning units. Each is the equivalent of about five to ten pages and covers key concepts of emergency communications. There are significant references listed at the end of each unit from such sources as the Federal Emergency

Continued on page 61

Geriatric Care for the Argonaut

It's hard not to mention the Ten-Tec Argonaut 509 when talking about QRP. For years it's been the standard by which other radios have been judged.

But the 509 is getting old. Some of the early models are approaching 25-years-old. If you own a 509, you'll find this installment of the QRP column your cup of tea!

What goes wrong?

Besides the usual problems of dried out capacitors and carbon resistors changing values, there's no one single problem that appears to be common to the 509.

One problem you will see in all of the older Argonaut-series QRP transceivers is loose or broken dial strings. Replacing the dial string is not hard, but getting to it can be a challenge. You must completely strip the radio down to get to the subpanel that houses the dial string. It's not hard to do, but I must warn those with weak hearts, it can be overwhelming!

Before you get started tearing into the 509, call Ten-Tec and order a dial string

rebuild kit. It contains everything you need to restring the transceiver. As a matter of fact, they're not very expensive — order two and keep one in the junk box.

And although I'll be talking about the Ten-Tec 509, the same procedure holds true for the Ten-Tec 505 QRP transceiver and the Ten-Tec 515 transceiver. As a matter of fact, even the Ten-Tec Century 22 and the original Ten-Tec Argosy use the same basic steps in dial string replacement.

The first step in getting to that dial string is to remove all the front knobs. Make sure you have the right tools to get the knobs off. Some have set screws, others have Allen screws, and then some knobs push on. After you have all the knobs removed, place them in a warm bath of mild soap and water. Let 'em soak for an hour or so to remove the dirt and crud. Wash them off with clear water and towel dry. You'll be amazed how much dirt can accumulate on those knobs!

Now, remove the two end pieces. There are several screws holding each into the aluminum chassis. Before you can remove the two end panels, there is an aluminum brace bar that runs from one panel to the other. This guy is located at the very top of the radio. You'll need a long screwdriver to reach the single screw on either side.

Once you have

the end pieces removed, place them down on a soft cloth. This will prevent them from picking up scratches to the walnut inlays.

With the end panels off, there are but a few more screws holding the front panel on. To get the front panel off, break out the hollow shaft nut drivers and remove the hardware around the controls. For goodness' sake, use the nut drivers and not a pair of pliers to remove the nuts. A slip of the pliers will send a scratch across the panel, leaving a deep gouge in its wake. Use the correct tools!

Carefully remove the front panel. Now, if you're lucky, the dial string will simply be worn out and not broken. The elastic cord routes over and under the pulleys. The elastic cord is fastened down via a solder lug just about under the main VFO tuning shaft.

It's almost always the elastic cord that causes the problems with the dial on the 509. The elastic cord loses elasticity and the pointer droops when you tune towards the low end of the band. Sometimes the droop is so bad the pointer falls down.

When I replace the elastic cord, I normally don't mess with the dial string. The elastic cord is fastened to the slide pointer using a granny knot. The dial string is left alone. Now, having said that, if you have purchased the restring kit from Ten-Tec, you might as well install a new dial string along with a new elastic cord.

Before you start removing the elastic cord and string, make a drawing of how the string and cord wrap around the various pulleys. This simple step can save you hours and hours of work later on.

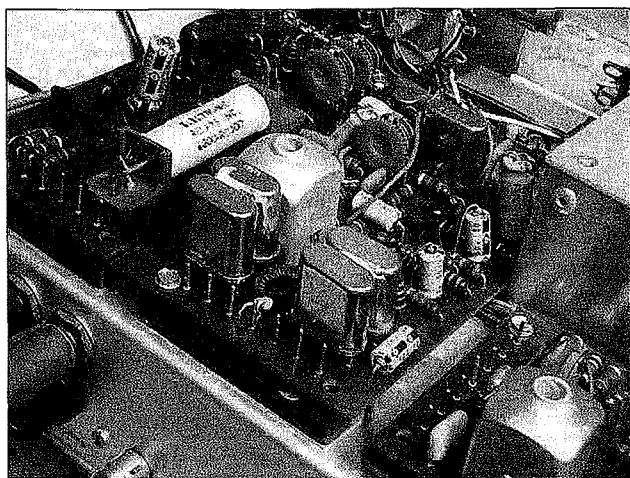


Photo A. The crystal filter used by the 509 is shown here.

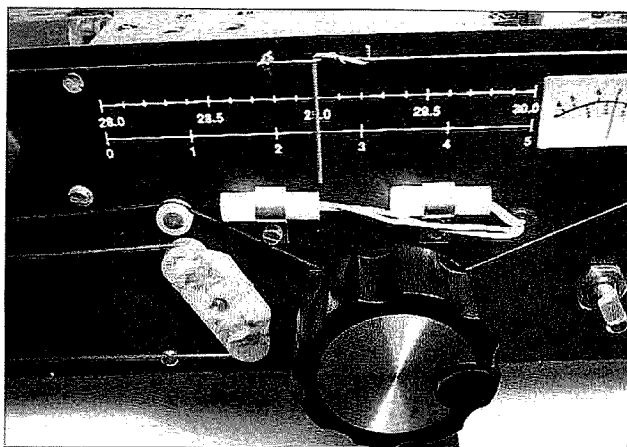


Photo B. The main tuning knob has been installed. Notice the lamps are on and the S-meter is working. I was working with the rig in this condition.

Since you now have the front panel off, carefully power up the radio and verify that the two dial lamps are working. If not, then replace them.

Some other tidbits before you reassemble the radio

Before you reinstall the front panel and end panels, flip the radio over so you can see the rear end. The front end tuning rack is now fully exposed. Check the front and rear bushing for grease. If your unit is dry, apply ever so slight a dab of multipurpose grease. I use bicycle grease. Radio Shack sells some multipurpose electronic grease, too. Remember, and this is very important, only a very, very small amount is needed. Too much will really muck up the works.

Some last minute touch-ups

Since you already have the radio torn

apart, take some time and remove, one at a time, the plug-in boards. All you want to do is remove the two screws holding the board down. Then carefully pry up the board. Next, reset the board back down into its socket. This breaks up any oxidation on the pins and sockets. Pay attention to how the board goes into the socket. You can easily get it turned 180 degrees around and then you've really had it!

There is no need to use contact cleaner here. You should not even think of using any cleaner with solvents in it on the chassis.

After you have reset the PC boards, it's time to reassemble the 509. Just reverse the process you used to tear it apart and you should have no trouble.

You may have noticed, in some of the photographs of the front panel of my 509, that the meter is reading S7. Well,

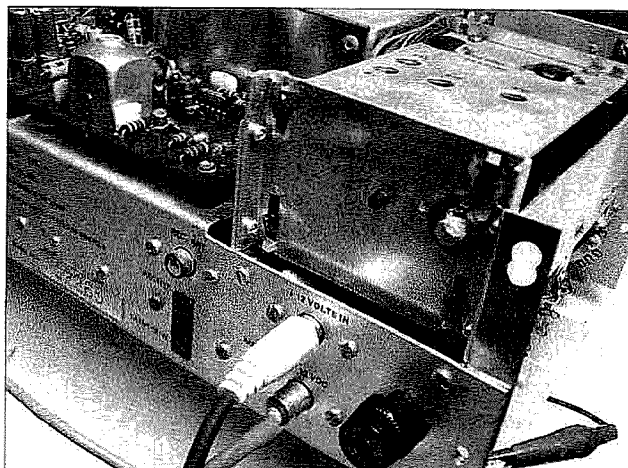


Photo C. The main resonate rack. Just a dab of grease on the area that moves up and down.

as I was replacing the dial string on my radio I had it setting on the MIDCARS frequency of 7.258. Of course I had to check into the service, and was given a S9+ report. Not bad for QRP and a radio spread all over the workbench! 73

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Photo D. Notice how the string is run between the two pulleys.

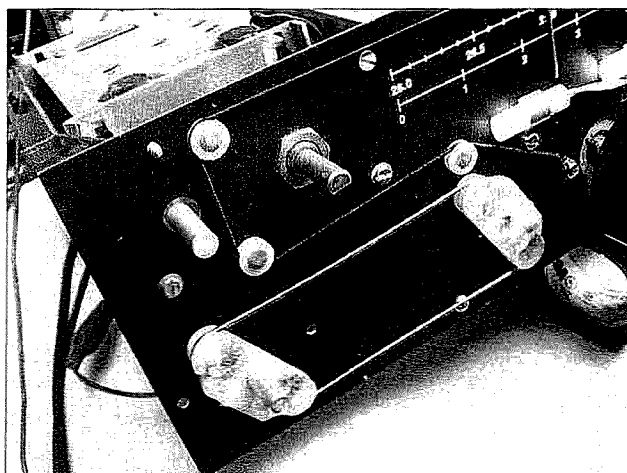
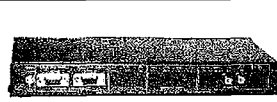


Photo E. Internal gang switches for the band switch.



New RIGblaster Pro from West Mountain Radio

The new RIGblaster Pro model from West Mountain Radio is the fourth in a series of RIGblasters. West Mountain radio was the first to offer sound card interfaces. Their new Pro model represents a revolutionary advancement in computer-to-radio interfaces. It is not only a sound card interface, but also a complete computer interface that will do everything you can do with a computer and a radio — even functions that have never been done before.

The Pro, like all other RIGblasters, supports operation with almost 100 different ham radio sound card programs that transmit and receive, with over 20 distinctly different modes. In addition to functioning as a sound card interface, the Pro also has a built-in rig control interface for most radios. Having both sound card and rig control in a single unit allows operation with a single serial port! HamScope (freeware), MixW, WriteLog, and other multimode amateur radio programs support using a single port.

The new RIGblaster Pro has two separate keying circuits, one for CW and one for FSK. A configurable secondary serial port provides compatibility with a wide choice of software.

Another new feature innovation is the ability to bridge your station mic to the computer as well as a radio. You can do digital recording of both sides of a QSO or perform high-performance transmit speech processing. With software off the Web, equalization, compression and noise reduction during phone operation is possible. West Mountain Radio is developing a special ham radio program optimized for phone operation.

New features unique to the RIGblaster Pro, include: front panel LED status indicators for PTT, CW, FSK, audio source, and audio level, making software setup easy; transmit computer speaker muting; front panel audio drive level control; electret mic bias; aux. plug-in headset mic jack; dual headphone jacks; dual PTT jacks, for foot switch or sequencing; radio and computer speaker loop through; and a power switch.

A RIGblaster Pro, a computer, and appropriate software can replace a mic equalizer/processor, rig control interface, multimode TNC, Internet remote link, contest digital voice keyer, DSP receive filter, receive enhancer, DX beacon clock that receives, and of course a sound card interface. You have all of this in one integrated package, for \$299.95.

The RIGblaster Pro is compatible with any sound-capable computer and any radio that has an 8-pin screw on or RJ45 mic jack. Accessory 4-pin screw on and RJ22 adapters are available. Some radios will work but their mics will not, only if they use RJ22 plugs or digital PTT buttons. The RIGblaster Pro comes supplied with the West Mountain CD, 12 VDC power supply, and all the cables you need to get on the air.

Contact West Mountain Radio at 18 Sheehan Ave., Norwalk, CT 06854; 203-853-8080; or go to [westmountainradio.com] for full details and on-line ordering.

Octavia Announces New Release of Visual Callsign Database

Octavia is pleased to announce the new release of Visual Callsign Database 3.0 ESD, a most comprehensive source of the Commonwealth of Independent States (CIS) callsign information.

First released in 1990 as R&R Callsign Database, VCD is designed to assist hams in successfully QSLing the CIS countries of the old Soviet Union. The updated version offers more photographs and most accurate and updated listings.

It covers all over the CIS (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Ukraine, Uzbekistan, Tajikistan, and Turkmenistan) and provides instant access to over 81,568 database entries.

VCD provides a wide range of features:

- Instant access to 81,568 entries, including current, contest, special-event callsigns, radio clubs, and silent keys.
- Data converted into their English language equivalents and presented in a form which will be recognizable by both International and Russian (Ukrainian, etc.) postal workers.
- 23,495 cross-references from old to new calls.
- 1,592 personal photographs and QSL card images. Slide show facility. All images are scanned and color-corrected by Octavia. Limited feature in unregistered version.
- DXpeditions with photos.
- 986 e-mail and amateur radio packet radio addresses, WWW URLs, and ICQ #.
- Over 5,500 home telephone numbers with area codes.
- Club membership information.
- Full date of birth and year first licensed.
- WW grid locator.
- Advisor utility. Marks incorrect/suspicious addresses.
- Powerful advanced searching capabilities: look up by callsign, name, address, postal code, ex- and special event call, region, WW grid loc., clubs membership, old calls, etc.
- QSL bureau listing.
- Data export into the clipboard/label printing.

Some of the VCD screen shots can be viewed at [www.octavia.com/callsignserver/vcd.htm].

A 30-day trial version is free to download from Octavia Web site at [www.octavia.com/vcd/download.asp].

Unlimited license can be purchased securely on-line or via postal mail for US\$20.00. All major credit cards accepted. Registered users will get the entire image library (100 Mb) to make their program fully functional, and one year of free updates.

Product options: The fully functional CD-ROM version is priced at US\$30.00. A CD-ROM subscription is also available. One year subscription includes 6 fully functional CDs delivered bi-monthly by mail. The regular price is US\$50.00.

About Octavia

Octavia Company, Ltd., has been developing Visual Callsign Database since 1989, and specializes in delivering design, print, and Web solutions for hams, small businesses, and companies.

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True Dopplers and Comical T-Hunting

Last month's "Homing In" took you on a journey that started with Christian Doppler's birth almost exactly two centuries ago. While trying to understand color changes in double stars, this astronomer/physicist was the first to document the apparent frequency shift of waves when source and observer are in relative motion.

Doppler radio direction finding (RDF) sets for ham radio came along in 1978, adapted from a spinning antenna scheme that was first proposed just after the Second World War. This month, we'll clear up

some misconceptions about antennas that produce Doppler shift without physical motion.

In a typical VHF/UHF Doppler RDF antenna unit, three or more whips or vertical

dipoles are equally spaced along the circumference of an imaginary horizontal circle. An electronic switch connects them to the receiver one at a time in sequence, for equal periods of time. This simulates a single whip moving along the imaginary circle at a physically impossible high rate of speed, sufficient to provide periodic Doppler frequency shifts in all incoming signals.

Many hams confuse the rotation frequency, the Doppler tone frequency, and the tone's frequency deviation, all of which are stated in Hertz (Hz). The array rotation rate (number of times that each whip is sequenced on in a second) is always the same as the fundamental frequency of the induced Doppler tone. Typical rotation rates range

from 300 to 1000 Hz, corresponding to the audio passband of narrowband FM voice receivers. Higher rates are avoided because they produce audio harmonics that may be interpreted as noise by the receiver's squelch circuit.

Peak FM deviation of the Doppler tone is given by the formula in **Fig. 1**. For best performance, deviation must be high enough that the tone can be easily detected and its phase determined when the signal isn't full-quieting and when voice or other modulation is present. A four-element set with whips in an 18-inch square, switched at 500 revolutions per second, produces peak Doppler tone deviation of about 0.5 kHz.

The bottom of **Fig. 1** illustrates the sinusoidal waveform that would be produced in an FM receiver discriminator by a single moving vertical antenna. **Fig. 2** is an oscilloscope trace of the audio output of the FM receiver in a typical four-whip Doppler setup. Signal wavefront phase changes that are presented to the receiver as the antenna elements are sequentially switched show up here as periodic pulses. All of the information necessary to determine signal bearing is contained in the amplitude, polarity, and timing of these pulses. The rise and fall slopes of the pulses and the "tilt" between them are functions of the frequency response of the audio stages, and are inconsequential. Note the large pulses of opposite polarity when switching to antennas #1 and #3, and the very small jumps at #2 and #4. From this, we can tell that the incoming signal direction is approximately perpendicular to an imaginary line through antennas #1 and #2.

A frequency domain analysis of the audio of **Fig. 2** looks like **Fig. 3**. The fundamental frequency (474 Hz in this case, same

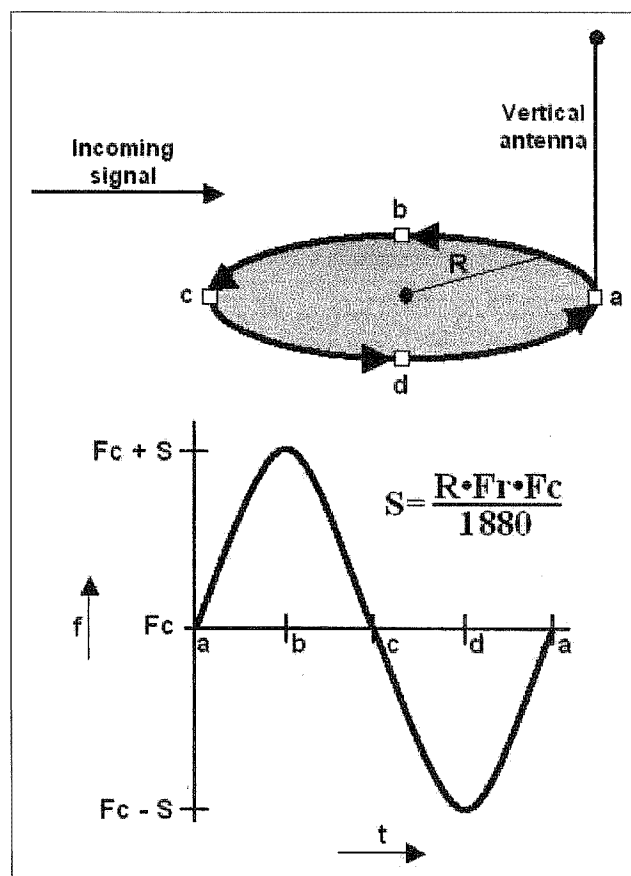


Fig. 1. As a vertical antenna element moves rapidly on a circular track, the Doppler shift imposes an FM tone on received signals. Peak FM deviation of the tone (S in Hz) is a function of signal frequency (F_c in MHz), circular rotation rate (F_r in Hz), and radius of the circular track (R in inches), according to the formula.

as the rotation rate) is the only component of interest for bearing determination. The array of harmonics comes about because of the switching steps of the audio. If you have encountered Fourier series in a math class, you'll recognize the characteristic decreasing harmonic values. Note that only odd-numbered harmonics are present (1422 Hz, 2370 Hz, 3318 Hz, and so forth). Changing the number of evenly spaced whips will change the relative levels of the odd harmonics, but will not add any even harmonics to the tone spectrum. This is important, as we will see in a later installment of this series.

In a practical Doppler set, a very narrow audio bandpass filter (as low as 2 Hz bandwidth) is synchronized to the antenna rotation rate. Because it is locked to the fundamental frequency of the Fourier series, this filter strips out the upper harmonics as well as the unwanted noise and modulation on the incoming signal. The output is a sine wave (like **Fig. 1**) with just the RDF information we want (relative phase) on it. It's nearly indistinguishable from what would be achieved with an infinite number of whips, which explains why it's possible to have high bearing accuracy with just three or four whip antennas.

Just like the movies

Despite the above explanation and the good performance of Doppler RDF sets, some hams have trouble accepting the concept of a few sequenced vertical antennas taking the place of a single vertical antenna moving in a circular pattern. This was the topic of considerable debate on an Internet discussion group for transmitter hunters about six years ago. Some writers claimed that it is impossible for switched verticals to produce "true Doppler" response. But no matter what you choose to call them, they do indeed follow Doppler's principle and the equations derived from it.

For those having trouble thinking this through, I suggested an intermediate step. Consider the theoretical case of an infinite number of individual whips and a perfect switching system in place of the single moving whip. This is the same piecewise approximation technique used in the calculus. There are tiny phase steps added to the received signal every time the switch operates, creating an infinite-step sinusoidal Doppler-induced carrier shift in the receiver discriminator output, identical to the physically rotating whip case. Doppler's frequency shift prediction still exactly describes the frequency changes that the receiver perceives.

Now reduce the number of whips from infinity to a practical number. This reduces the number of pieces in the piecewise approximation of one rotation from infinity to the number of whips. The receiver's discriminator output still includes phase jumps corresponding to antenna switching steps, but they are fewer in number and greater in amplitude. The phase information necessary to determine our RDF bearing is still present in the fundamental frequency term of this series. The harmonic content is greater and more filtering is required than in a million-whip array, but our narrow bandpass filter strips all the harmonics out.

Some members of the Internet discussion group were still troubled about all the simulated antenna movement being encoded in very brief phase jumps, while the rest of the time one antenna is connected to the receiver. But the important thing to remember is that it's the combination of both the jumps and plateaus (switching and sitting times) that simulates the motion. When you watch a movie, you are seeing a series of still photos (frames) that snap from one to another with rapid transitions. It is the combination of transitions and still frames that the viewer perceives as smooth motion. The eye and brain act as a filter, just as the filtering in the Doppler set. If you were to eliminate either the still frames or the transitions, then the simulation of smooth motion on the screen would be lost. Similarly, the combination of both the phase steps and the plateaus in between creates the waveform that the narrowband filter uses to extract the Doppler data with high accuracy.

With this explanation, almost everyone in the group was convinced. Then one writer pointed out that the peak amplitudes of phase jumps in the receiver output are not affected by the array rotation rate. Amplitudes remain the same because the phase steps are a function of the number of elements and direction of signal only. They remain the same number of electrical degrees when the rate changes. This appears contrary to the Doppler equation of **Fig. 1**, from which increasing the rotation rate (F_r) should always cause increases in the deviation amplitude (S). Does that mean that it isn't a true Doppler after all?

This writer's incorrect conclusion came about because he confused phase modulation (PM) with frequency modulation (FM). They are similar forms of angular modulation, related mathematically but not identical. An FM signal's deviation is a function of only the amplitude of its modulating waveform, and is independent of the modulation frequency. PM deviation is a function of both



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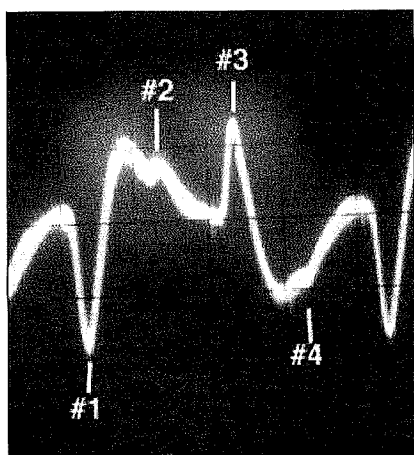


Fig. 2. Audio output waveform of a receiver with a typical four-whip Doppler set in operation.

the amplitude and frequency of the modulating waveform. In PM, the higher the modulating wave's amplitude and/or frequency, the greater the deviation.

A quick bit of history: In 1936, before phase-locked loops and other modern direct-FM producing techniques, it wasn't possible to achieve distortion-free high deviation in stable oscillators. So Edwin Armstrong

invented an indirect method of transmitting VHF-FM. A crystal oscillator was followed by a "serrasoid" phase modulator, and then by several doubler and tripler stages that also conveniently multiplied the deviation.

Armstrong's method directly varied the phase of the RF signal, which indirectly varied the frequency. By shaping the audio to be transmitted prior to applying it to the phase modulation stage (increasing the levels of low frequencies at a 6 dB per octave slope), his transmitter's output was indistinguishable from that of a direct-FM transmitter. Phase modulators with audio processing to achieve FM were standard for many years. These circuits were in the transmitter of the FM broadcast station that I tended in college and in the VHF/UHF business-band rigs that we converted to ham frequencies in those days.

If we increase the switching speed of a Doppler array, the phase changes and thus the voltage peaks in the discriminator output do indeed remain the same for each jump in a cycle of rotation. The induced PM level on the signal has not changed. But since we have increased the rotation frequency and hence increased the frequency of all tone components coming out of the discriminator, the equivalent FM signal being detected

does indeed have proportionally greater deviation. So the Doppler equation is indeed being followed, and we do have a true Doppler RDF set after all.

How many whips?

No matter how many vertical elements in your Doppler array, the adjacent elements along the rotation circle must not be more than 1/2 free-space wavelength apart, to avoid ambiguous bearings due to phase steps of greater than 180 degrees. Furthermore, adjacent element spacings of greater than 1/4 wavelength will produce phase steps of more than 90 degrees, lowering the level of the recovered audio tone and worsening the signal-to-noise ratio. With that in mind, the optimum spacing for a four-whip "square" mobile array for VHF or UHF is slightly less than 1/4 wavelength on a side at the highest frequency to be used. For two meters, that is about 18 inches on a side.

Would eight elements be an improvement? It would reduce the harmonic content of the recovered Doppler tone, but that wouldn't be noticed with a good 2 Hz bandpass filter. More whips in the same size array would mean closer spacing and thus more RF coupling between them. That would be detrimental to performance in areas of high signal reflections, as we'll see in a future installment. So in practice, the difference in performance between four-whip and eight-whip Dopplers of the same array size usually isn't significant.

On the other hand, for a fixed installation such as your home rooftop where plenty of space is available, or for a car-top array at UHF or microwaves, the added complexity of more elements in a larger array allows you to improve performance by increasing the overall array size (aperture). Consider a two-meter eight-whip array in an octagon pattern of 18 inches per side (i.e., the same adjacent whip spacing as the typical four-whip Doppler). Radius of rotation is more than double that of the four-whip set, giving over 1 kHz Doppler tone deviation at the same rotation rate. The array aperture is more than doubled, which improves performance in multipath.

The downside is that this array has a diameter of almost 4-1/2 feet, so it won't fit on most vehicles. Furthermore, you would need 7-1/2 feet total diameter to provide ground plane under the whips. But a similar size (in wavelengths) array for the 70 cm band (440 MHz) would be only 2-1/2 feet diameter, which is practical.

A final caution: The equal spacing of

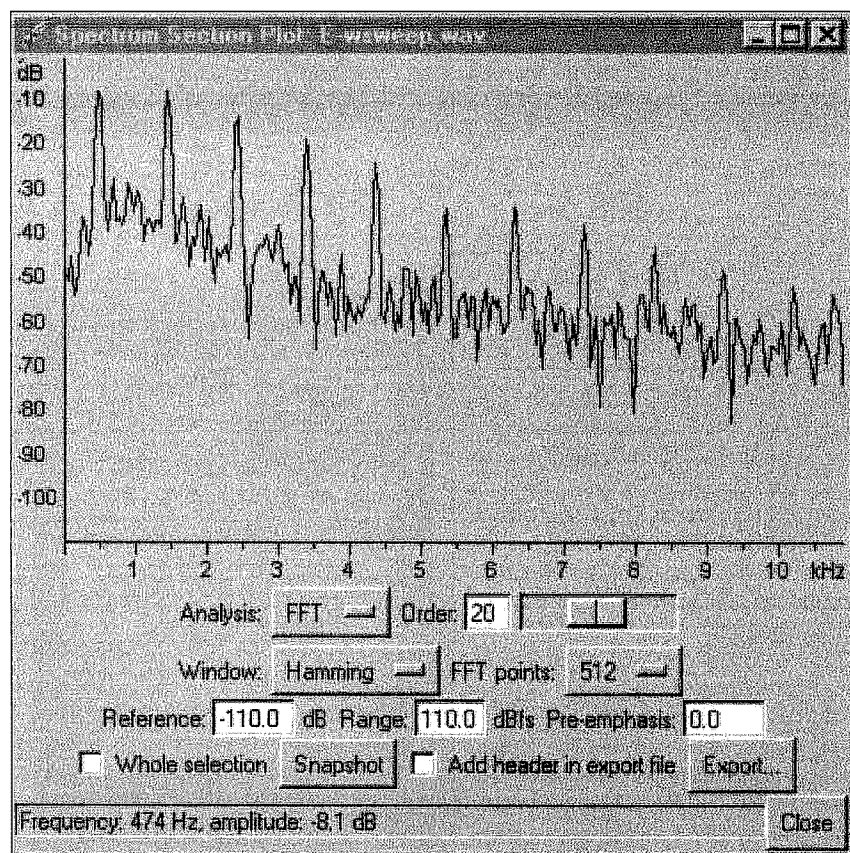


Fig. 3. Frequency components in the audio output of a typical four-whip Doppler.

A New Definition for "Narrow": SSTV within MFSK!

Advances in the digital art are surfacing rapidly. By the time you read this the narrowband SSTV described here will have been added upon to such a degree that this article will take on the appearance of a Stone Age review. But, you can always say you saw it here first.

This is being written just after Christmas 2002. There are two reasons to mention the timing. First, there was an interesting Subject Line on the MixW message reflector where this new mode was introduced that announced, "Merry Christmas." It was well timed as a "gift" from Nick UT2UZ. The second is, as I mentioned, that the information in this article will be pretty much out of date in a very short few months.

To get right to the point, we now have a narrowband SSTV mode that is legal in the digital portions of the ham bands, at least as far as has been interpreted. The only clutter that will result is that there are going to be so many users, we will soon be standing in line for a turn to transmit. Well, that is an exaggeration I am sure, but I found it quite easy to initiate my first two contacts to experiment with the mode.

What is needed is the latest version of the MixW software, starting with the beta package MixW2.06xj, which was the release on Christmas Day. It has a cost, but it is the same as it ever has been, \$50 US. To explain, if you paid once, you have paid for all the updates with that one-time charge. One other quick point for those unaware: The noncrippled demo version can be had for a free download.

I have read complaints that IPEG files would not work and, as of this early usage, I had four JPEG files and four bitmap files and the only success was with the bitmap files. Someone offered the opinion that this was because of some system abnormality. The image shown in the screenshot here was claimed to be a JPEG. So there is somewhat of a learning curve as yet. We will have to watch and see how this plays out. There was an early rumor there would soon be a color version.

What is important is that it works.

Whatever bugs that surface will be dealt with as usual. The other interesting thing is the mode hit the streets and suddenly everyone seemed to know how to use it. The strange part about that is up until this writing and after using it myself, I have not seen any color-by-the-numbers for setting up for the mode.

That means the process is easy and intuitive. I got some hints from the reflector about a <PIC> macro and some suggestions about which was the best way to use it. Then I looked in the list of macro commands that come in the program and <PIC> wasn't listed. Of course I tried it anyway and it works.

I think everyone else who was fascinated by the idea followed similar steps. There was mention on the MixW reflector about approximate dimensions and that the images needed to be in black and white. Quite a few of us have graphics software to facilitate these conversions from regular digital images we have stored.

So, this was really easy. In my case, there was no outlay of cash to get into the MFSK picture-sending frenzy and have some fun. That is what I did. I realized after making the screenshot that my log demonstrated this to be my second venture into the mode. If you read it carefully, you will discover there were at least two days between those two contacts.

Some of the time was devoted to other real-time projects (somewhat related), and a portion of the delay was caused as I went through images and organized a few and assigned them to individual macro buttons. The result was to see what the difference was between the JPEG and the bitmap formats, and I could choose them on the fly. This did not cure all my clumsiness, but saves other operators from waiting for me to find images.

I did it the Hard Way first

There are other issues, such as another way to use the <PIC> macro. I went with the straightforward method of writing a macro to fetch a specific file from a specific directory (folder). That is, I made a directory, C:\NarSSTVImag, with the doctored images residing within. So, the first macro I wrote was <PIC:\NarSSTVImag\V&TinCC.jpg>

You can see why I chose to write separate macros for each image (length — hard to do this on the fly). Incidentally, this macro is written correctly but would not transmit, but the macro in the button next to it is the same image in bitmap form, extender .bmp, and it flies just fine.

I learned to "go with the flow"

In the end, at least at this writing (it keeps evolving as I write), the newest and easiest to use macro is <PIC?N>. With this macro in place, all you do is evoke it and the main MixW directory is displayed with only the graphics files. To be clear, this means you must store your images in the MixW directory (folder) to use this method. This allows you to click on any file and a thumbnail is displayed so you are sure of content; then double click and it is in place to transmit.

As this is being written, I checked and already someone had found the reason why the above JPEG file type would not transmit. It was a converted file using the Paint Shop Pro software to convert from color to gray scale which appears as black and white. The author of the fix I just found said he had discovered the working solution is to "decolorize" the pictures using the same program. He gave an explanation, but I will leave that to those who enjoy discussing technicalities.

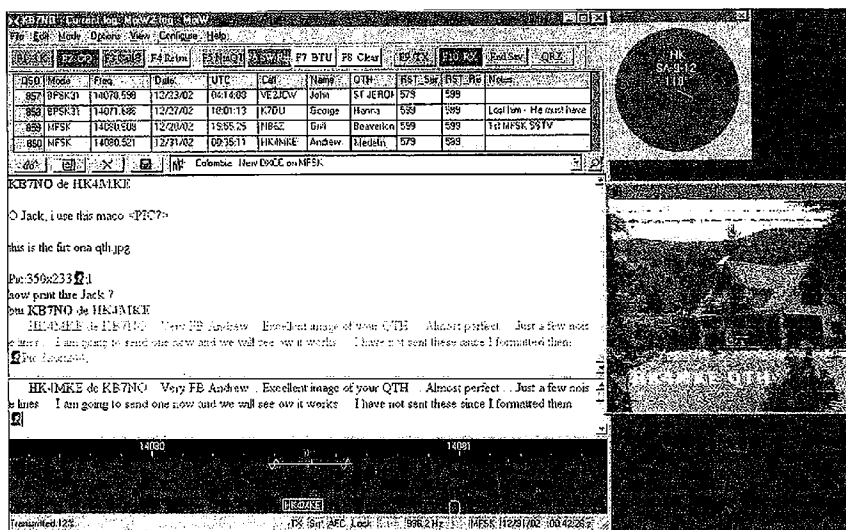


Fig. 1. NBSSTV over MFSK! Some real fun with images where you never expected to use them. The frequency was at 14.080.5. The mode is MFSK, but the difference is the black and white image to the right of the screenshot — under the world map — was received using this mode. This was one of the first few QSOs I had in this mode and it was learning time, but it was working and with no real instructions. The method is fairly simple, see the text. Note the little icons in the text fields. These appear as you load an image and when it begins to transmit. At the time of this shot, I was sending an image. If you will look to the bottom left corner you will see the message, "Transmitted 12%." It takes about the same amount of time to send an image in this mode as by regular SSTV. All you need is for both stations to have the same software, and there are plenty of hams in the action already at this writing. You won't have a problem finding someone to try it out on. And if you do not already have a copy of MixW, the 15 day noncrippled download is free. When you try it, you are hooked!

Speaking of the learning curve, the users are the best source of information. During the QSO shown in the screenshot, Andrew sent back one of my images and I mentioned I had no idea how to save the image for return as he had. He explained simply all that was necessary was to click the little emblem in the upper left corner of the SSTV screen and follow the directions. From there it is automatically saved to the MixW file by default. Things a guy can learn if he will but ask.

In the regular SSTV software there are opportunities to save images in a similar and

usually automated manner. In this MixW method, you can gather images or not bother with them, your choice. The only real problem with saving them is remembering to delete them before sheer clutter sets in.

All in all, I must say this is the regular ham way to have fun. Spend a minimum of bucks, if any, and jump into the middle of the action. No one is upset if you blow a few transmissions. Other users will do their best to help you get it right the next time, hopefully before the end of the QSO.

The other end of the SSTV spectrum

There is another new mode out that I have not as yet had the time to experience. I stuck in the little heading about the other end of the spectrum after having given the Narrowband SSTV a plug that included low cost. You are not to believe this next item is pricey by contrast. It is the idea of, believe this (it is difficult to think about), High Definition SSTV, and it is freeware.

Whew! That becomes a mind twister when you think of it in the terms of ham modes we are accustomed to using. If you want to see some truly great, about as flawless as you can imagine images, take a look

at [<http://home.att.net/~ronchap/hamhdtv/hdsstv1.htm>].

These images easily equal the quality of prints you see in the best slick magazines.

The software for this is, as stated, free for the download. I downloaded and installed this program. It can be found at the Web site where you download the SSTV-PAL and other such programs that you can link to from *The Chart* on my Web site. And there are others available from links to the above referenced URL. Even a Linux version is available. The only drawback I can read into the literature concerning this program is they say you should have a 2 GHz CPU for best results. Mine is a bit slower but when I find someone willing, I will make the test run. It is really worth a look and appears very simple to use.

I got into too much of a rush

And speaking of SSTV, I mentioned last month that it looked like the creators of ChromaPIX, Silicon Pixels, had packed their tent. Just after that message got sent to the magazine, I received word from an alert reader there is a new Web site, which I edited into *The Chart*. So the link has been ready for some time before you read this and all is well. Another great software, often referred to as the benchmark for SSTV software, is still with us.

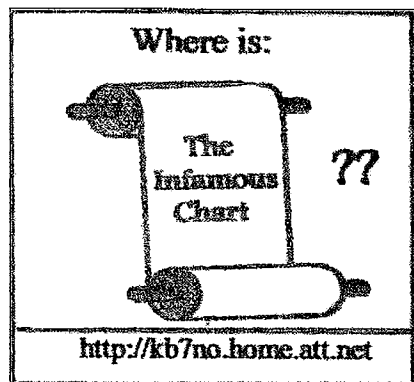
The Linux Project

This one really stretches the imagination. I have been working, or reporting that I am working, at getting a Linux work station up and running with ham software in place. Been a rough go and many of you have been very sympathetic toward the cause. I have received a lot of encouragement and that is appreciated.

The latest is that it is getting closer to fruition. At long last, I put a page on my Web site about the Linux experience. It is not complete as yet because this thing is really testing my stick-to-it-ive-ness.

But the progress at this point in time is that I have successfully gotten all the ducks in a row as far as installing an "off-brand" (I think all Linux software is considered off-brand by those not involved) hamware named KPSK. A bit more configuring and it may just fly by the time the last of the snow is shoveled around these parts.

There have been some interesting learning opportunities as this adventure has unfolded. A lot of this centers on support for different operating systems. Linux can be tough to get all the square pegs in the assorted matching holes, but so can a lot of





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the technology we see these days. Some of the marketers make quite a point of telling you about support, then when you call for help you are asked to ante up for each session. I have to be seriously desperate to succumb to this blood letting, but I go along on occasion.

As for the matter of the Lindows operating system, that turned out to be a definite pay-for-play adventure, and that is okay for some because that company appears to be providing what they charge for. I have no regrets. They were definitely part of my education in the Linux vein. I was glad that some other avenues were open that I have been following.

Currently, I am working with an early release of Red Hat, and a ham suggested I join the Red Hat Network. This is a freebie where updates are available for the download. Another education awaited me. They have this all set up to automatically probe the system that connects to them — yours or mine — and tell us what updates are available and provide the download. Once the files are in place the installation is extremely simple. Even for me.

I understand that the Mandrake package for Linux has a similar offering. So here are two major players in the Linux field offering automated support to help make these things run.

Alas, this does not solve all the little problems of getting everything sorted out, but there are also a lot of folks, in our case Linux using hams, who are very understanding of the problems that beset us when we attempt to make these crazy machines work. And that is another source.

Now, just a little side glance in defense of the folks at Microsoft. They do similar things. Many of you are aware of this. Recently, I had occasion to stop by their update area on the Internet to download a file I did not have, and found a number of updates not in this Win98se. So I downloaded the whole bunch of them, and when the files were downloaded the system automatically installed them for me. Pretty good. Lots of pros and cons to discuss there but it is

Continued on page 56

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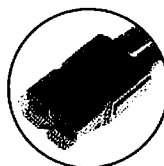
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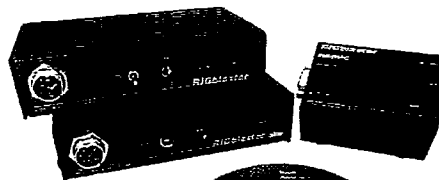


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THE DIGITAL PORT

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definitely a service as good as any that we don't hear much about.

A little in the form of editorializing

What I am saying is that there are some real advantages to getting a Linux system up and running. I feel I am a pretty frugal person when it comes to money spent on computers as I sit here with this machine that once cost over \$1,500. And if I were to update the operating system to the latest and greatest according to Microsoft, it would be faster but I would then have to buy new software to replace the stuff that is already working.

There is a bit more to the story. The previous machine ran with updates for about eight years before retirement and had somewhere between \$2,500 and \$3,000 dollars invested in original outlay and "improvements." This allows me to make a conservative estimate that I have spent in excess of \$4,500 in ten years to play the "keep up with the Jones'" computer game.

What is the point? This is a way better method to acquire income than when razor companies sold cheap razors that needed expensive blades replaced every couple of days. All that is necessary to get us to spend more on these Windows systems is to come up with irresistible games and toys that will only run on newer systems that require everything else to be replaced for more expense. That is why I have found a kind of ground zero with Win98se and attempt to make it do everything I want.

Now, the idea of the Linux workstation is to assemble a machine that never has an expensive major update. In the project I am working on, I have not as yet finished buying hardware because I am still dancing around the iffy getting-it-going phase. When I see the light at the end of the tunnel I will have to go for a decent monitor and a few small items, but I expect to get this thing all together doing almost every essential word processing, graphics, and ham-oriented procedure that I do with this Windows machine, with a total outlay of under \$700, and never need a major update! Quite a contrast.

The problem? Nothing about this system thus far has been plug-it-in-and-turn-it-on and start to use it. It is a slow tinkering process. Sometimes I really have negative thoughts about the folks who build all these little packages of software for the Linux system that don't seem to communicate with each other. And you know what? I don't think that bothers those folks. They seem

to say to us, "If you want the advantages of the system, you gotta learn to play our way."

To tell the truth, I don't mind that as much as it appears. What I want to do is get the ham community I can reach to take a look at this stuff. My real hope is that I can tell you a complete enough story so that you can bypass some of the problems I have encountered and get into this system and enjoy the advantages yourself.

That's it for this month. Keep those digital fires burning. 73, Jack, [KB7NO@att.net].

Build Your DREAM Antenna

continued from page 13

plug or to an accessory outlet — watch the current maximums allowed here. They may be a lot lower than you expect, so read your owner's manual! Otherwise to run high power, run your power lines directly to the battery with fused lines. Be sure to run that second ground wire I mentioned earlier from the ground lug on the rig and use some sort of quick connect plugs to attach/detach to the ground wire for ease of removing the radio each day.

[By the way, if you own a 5-door vehicle and getting into the hatch is going to be an issue for you (I just don't use it), check out some of the sites I've listed for special mounts to handle this.]

As a last step, take a little time to arrange the cable neatly from the back of the vehicle all the way to the radio. Try to keep it out of tripping distance by tucking it under molding or carpet where possible. I've found that especially near the doors, it's easy to unscrew the molding, place the cable down and screw the molding back in place all in just minutes. It will save you a lot of aggravation later.

Testing it out — swinging the beam

Find an empty parking lot somewhere — up on a hill if possible — and scan the band for a decent signal. It's important to know this, so listen up. This is a directional antenna. Try pointing the front end (diagonally opposite to the side you have the antenna mounted) toward the incoming signal. While the station is talking, slowly

turn the car away from the signal and then back again — you've got a mobile beam! When the signals are down, take advantage of this fact, it does help! I've logged many hours of fun with this type of antenna system and you can, too. It's a great DX antenna and you'll see the best results on those long hops.

Is this antenna system for everyone? Of course not! But for me, it's a "DREAM" come true!

Special swivel antenna mount pages

[www.firestik.com/Catalog/MK-SB18.htm]

[www.firestik.com/Catalog/dvvsb.htm]

[www.aifenterprises.com/mobile1.htm]

[www.shakespeare-marine.com/antennas/mounts/swivel-81-s.htm]

[www.soft.donbass.com/igor/YACHTA1/shakespeare_mounts.htm] 73

Junkbox Telephone Recording Adapter

continued from page 22

because of the variety of pinouts of the salvaged components. P1 and P2 are each connected to the perfboard using about 1 foot of twisted pair wire each.

Twisted pair wire can easily be made with a variable speed drill. Simply put the ends of the two wires in the drill chuck and tighten. Hold the other end of the wires taught while running the drill at a slow speed. Turn the wires until the pair has about two turns per inch. Remove the wires from the chuck, trim, strip, and tin the ends.

The J2 ring connection (-) is connected to ground with a 6 inch piece of wire. The J2 tip (+) connection is wired to one side of switch S1. The other side of S1 is connected to the IN terminal of voltage regulator U1. Refer to **Fig. 2d** for U1's pinout. I will leave it up to you to be able to mount the Telephone Recording Adapter assembly into a suitable enclosure.

Testing


Plug in the 9 VDC wall transformer.

Insert the wall transformer plug into J2. Turn on S1. The green LED (D8) should glow. The yellow LED (D7) should also glow, indicating an input voltage at J1 of less than 24 volts. If D7 and D8 are not on, check for proper installation of these LEDs. Measure continuity at P1, tip to ring. The reading should be a short circuit. Next, plug the phone line into J1. With all of the phones on the line "on-hook," the yellow LED should be off. If this is not the case, check for proper installation of D1 through D5.

Use

Obtain a tape recorder with "MIC" and "REMOTE" inputs. The MIC input is a 1/8 inch (3.5mm) jack, while the REMOTE input is a 3/32 inch (2.5mm) jack. Plug the power cord of the recorder into the wall and insert a blank tape (it should be rewound completely) into the machine.

Make sure the 9 VDC transformer is plugged into the wall and its output connected to J2. Verify that S1 is off. Ensure that J1 is connected to the phone line. Next, plug P2 into the MIC input and plug P1 into the REMOTE input of the tape recorder. Put the tape recorder in the RECORD mode (this is usually accomplished by pressing the PLAY and RECORD buttons simultaneously).

Then, turn on S1. The green LED should glow. The yellow LED will glow if any telephone on the line is "off-hook." When the yellow LED is on, the phone conversation is being recorded. As mentioned earlier, turn off S1 to disable the Telephone Recording Adapter. 

Meter Made

continued from page 25

the voltage and current in an adjustable power supply. Fig. 5 shows a 12-volt, 5-amp circuit diagram built around an LM317T adjustable regulator IC. A PNP "wraparound" power transistor increased the current capability from 1.5 amps for the LM317T to 5 amps. The voltage is adjustable from 11.5 to 14.5 volts. This is the

range of voltages normally seen in equipment powered by an automobile electrical system.


The voltmeter uses the expanded-scale circuit of Fig. 4 with expanded-scale markings on the face. The ammeter uses the circuit of Fig. 3 and is placed in the input of the regulator circuit. This placement eliminates the effect of any voltage drop across the meter shunt resistor from affecting the output voltage. With this placement, current drawn by the regulator circuit itself is included in the meter reading. However, the regulator circuit draws less than 5 mA, a negligible amount on a 5-amp meter scale.

Other uses

There are many other uses for recycled meters. An SWR bridge requires two meters. If purchased new, the cost would be prohibitive. With recycled meters, the cost is zero! Recycled meters can also be used in a dipper instrument, or as an S-meter in a home-built receiver. Other test instruments are described in the new book *Test Equipment* by Guido Silva I2EO, which is available from Barnes and Noble and also from Amazon on the World Wide Web [www.amazon.com].

Drawing the new meter scales

New meter scales are best drawn on bright white paper with black ink. If the original meter needle is white, you can make it black with a black felt-tip marker. Those with artistic talent can envision many other possibilities. I used a pen plotter to draw the scales for the meters on the 12-volt power supply as seen in the photos.

I hope to see many projects described in this journal using recycled meters. It's great fun to build your own instruments and gear. 

All About Electronics Frustration

continued from page 37

level, the detector became alive and the FM radio played in a manner that appeared to be normal. Of course, after

dropping the power, then restoring it, the FM radio was DEAD again. Repeating the signal generator injection again worked, but only periodically. During the time the FM portion was working, the AM portion worked as well. OK, where do I go from here? The problem appeared to be around IC2 — was the chip good or bad? And, if it was bad, what then?

So how do I proceed to troubleshoot a chip that has no published available data? The first step during this part of the process was to examine the board under a magnifying glass to see if any bad solder joints or broken traces were visible. As you might expect, everything looked good and no obvious problems were detected.

Studying the schematic regarding the part surrounding and connecting to IC2 suggested that checking the parts should be the next logical step. Each capacitor and resistor was removed individually from the board, checked, and then returned. No problem was found. The next thought I entertained was that perhaps one of the IC pins wasn't properly soldered even though it passed a visual inspection. Each pin of IC2 was resoldered, but that process failed to repair the problem.

What fixed the problem? Even though the IC pins appeared to be soldered, I had to assume that there was a hairline crack in the circuit trace connected to one of the IC pins. Though each trace appeared to be OK by visual inspection, I chose to clean off the solder mask on a small section of the trace adjacent to each pin of IC2. Each trace section was then chased with solder that functioned as a bridge. Obviously this had to be the cure because the radio, with power applied, operated as expected. Even varying the supply voltage from 1.5 to 3.2 volts failed to disrupt the normal operation — absolutely unlike previous tests. With the radio now operating, more data was desired for future reference. A voltage chart for each IC pin was developed and is shown in Table 1.

Conclusion

For a "simple AM/FM broadcast radio," this Panasonic is sure packed

with a lot of electronic features for its physical size. As a result it was far more complex to troubleshoot than anticipated from looking at the exterior of the box.

You will always ask the question "Should I tackle this repair task?" when the neighbor approaches with a project in hand. Although the AM/FM BC radio isn't ham-related, the electronic portion and the troubleshooting techniques involved certainly relate directly to any ham-related piece of equipment. Learning the skills for troubleshooting problems can pay off in the long run. So why not practice on the neighbors' simpler equipment before tackling a ham rig? 73

Travels with Henryk — Part 10

continued from page 39

Lithuania, I could see that the spirit of homebrewing is still high there (**Photo E**). Ricardas is not very active from his

apartment due to limited living space and antenna restrictions. So he spends quite some time at the club station which has the callsign of LY2ZO. There is more space ... and provisions for running more power (**Photo F**). These Russian power tubes can deliver much more than the official limit of 200 watts!

The LY2ZO club is probably the most successful contest club in this part of Europe. This is a result of many years of improving the skills, antennas, and equipment. The man behind this achievement is Algis LY2NK (**Photo G**). He has spent the last 40 years, against all odds, building antennas and equipment, encouraging others, going on contest expeditions, winning contests, and so on. His efforts have been recognized internationally, and Algis LY2NK was elected to the Contest Hall Of Fame, Number 37. The contest station of LY2ZO club is out of town, with separate operating positions for each band (**Photo H**) and an impressive homegrown antenna farm. More pictures can be seen at the club's Web site. For contest purposes, the club usually uses its shorter contest callsign, LY7A.

I have often wondered why in some places, without technological tradition and appropriate industrial infrastructure, amateur radio activity is high. What is driving people to devote so much time and energy, overcome obstacles, deploy and develop ingenuity, all not for profit? Maybe this is the elementary essence of our hobby — to learn and improve the skills, go forward. The more difficult it is, the more fun and satisfaction it gives. Lithuanian radio clubs, and there are many more of them than these two that I visited, can serve as evidence of my point. 73

Front and Center

continued from page 41

white paper is less expensive than using colored paper. I use the colored paper for the background. My printer, an inexpensive inkjet type, doesn't "fill" background well, and I like the total color of the colored paper. Having

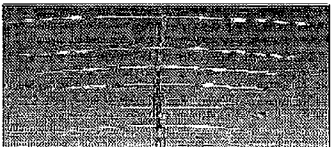
made a final copy on the chosen colored paper stock, it's time to adhere the print to the face plate. Using contact cement, coat the face plate evenly using a soft brush or foam applicator. Now carefully place the print on the prepared plate. Ensure that the holes line up, the lettering and designs aren't beyond the ends of the plate. It sometimes helps to hold the plate with the paper attached up to the light, to be better able to see where the placement is. Be careful not to have excess cement find its way to the surface of the paper. It will be impossible to remove and will be a "blemish" on your work. Once you're satisfied with the placement of the print, and the cement has had time to cure, use "Krystal-clear" wide transparent adhesive tape (*misspelled, but that's what it says on the roll*) to coat the surface of the panel. Using clear tape provides protection for the paper from absorbing oils from fingers, and a measure of resistance to wear.

Now that the print is adhered to the surface, has a layer of clear tape protecting it, and you're happy with the results, it's time to remove the excess paper from around the borders of the panel. Using a razor knife or single-edged razor blade, trim the excess from the panel. Use the edges of the panel as a guide, being careful to cut only the paper and tape and not your fingers! The edge of the panel provides a solid rest for the blade, enabling it to produce a clean, sharp cut. If you began with ten fingers and have ten remaining, then the operation was a success!

The key to this project is "learning what's already in your word processing program." Panels that are attractive and distinctive and personalize the project you've worked on are easy to create in "Word." **Photos A and B** are of a 5.25 MHz to 5.4 MHz receiver project I've been working on. The case of the project was a "left over" computer item. The panel slips into slots and the top snaps over it all to keep it together.

Play a little bit! (*They ... call it playing, but we can call it "designing."*) You've nothing to lose but some time and paper. Who knows, you may even be delighted with the results! 73


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CALENDAR EVENTS

continued from page 44

computers, software, peripherals, hardware, amateur radios, and components of all kinds. There will also be flea market tables selling used equipment in any of the areas listed, and more that would attract the electronics hobby enthusiast. Friday evening setup details will be sent with table registration. Admission is \$6 in advance or \$8 at the door, with people 15-years-old and under admitted free. Advance discount tickets are available at Amateur & Antique Radio Consignment Center, Pavak Museum, and Radio City. For further info call 763-537-1722, or visit [<http://www.k0ltc.org>]. Send E-mail to [k0ltc@visi.com]. **Advance prices:** All electricity paid in advance is \$15 extra, charged once per vendor. 8 ft. swap table \$25 each. Table in Club Corral \$15 each. Commercial booth \$125 each. VE exams registration required. NO walk-ins. For info, contact *Denny Ackerman* by E-mail at [kb0oqq@arrl.net], or call 651-769-0358. VE fee is \$12. Please plan ahead and bring copies of all your documentation. The site is handicap accessible. Send a check payable to RARC (no cash please) and mail by March 15th to *Robbinsdale Amateur Radio Club, P.O. Box 22613, Robbinsdale MN 55422*. You must include a legal size SASE. Requests received without an SASE, or after March 15th, will be held for pickup at "Will Call." After **March 15th**, swap tables are \$35 (add \$30 for electricity) subject to availability. Club tables \$18. Commercial booth \$135, electricity \$30 extra. Swap table confirmation will be mailed after March 8th.

LATE MARCH

ST. LOUIS COUNTY, MO, AREA Severe weather "SKYWARN" training is being scheduled. Volunteer observers are sought in the St. Louis County area. There is no cost for the training and it is offered numerous times during the month of March to accommodate as many trainees as possible. Reservations are not required. There is ample space and parking is free. Participants from out of the area are also welcomed. The training is being sponsored by the St. Louis County SKYWARN Program. Level 1 (basic) and Level 2 (advanced) training is being offered, as well as a Severe Weather Safety & Preparedness Class, and a Disaster Damage Assessment Class. For those wishing to become amateur radio operators, an eight week class is offered beginning in late March. For the schedule of events, call 314-615-7857, or check the Internet at [<http://www.stlouisco-skywarn.org/>] or [<http://dlw.hispeed.com/sabre/Skywarn.html>]. If you are in the local area, please check into the monthly SKYWARN net on the first Thursday of each month at 7 p.m. on the 146.940 rptr. For more info contact *Michael Redman* at 314-615-5362 or at [mredman@stlouisco.com].

APR 13

STOUGHTON, WI The Madison Area Repeater Assoc. will host the Madison Swapfest on Sunday, April 13th, at Mandt Community Center, Stoughton Junior Fair Grounds, on South Fourth St. Doors open at 8 a.m. Talk-in on 147.15. For more info contact *Madison Area Repeater Assoc., P.O. Box 8890, Madison WI 53708-8890*. Phone 608-245-8890. For fast access to more info, check the Web site at [<http://www.qsl.net/mara/>].

APR 27

GALVA, IL The 4th annual W9YPS/AA9RO Hamfest will be hosted by the Area Amateur Radio Operators Club, 8 a.m. to 1 p.m. at the Galva IL National Guard Armory on 150 Morgan Rd. Advance 3-stub tickets \$5, 1-stub tickets \$7 at the door. 6 ft. tables \$10. Reserved tables not paid for by April 15th may be reassigned. Breakfast and lunch will be available. Talk-in on 145.490 - 88.5 PL. There is a large outdoor flea market area with handicap parking and the building is handicapped accessible. Some electricity is available, first come first served. Bring your own extension cords. Please contact [wd9hcf@arrl.net] for details about VE exams. For more info contact *Mat Bullock W9SIX, 419 College St., Kewanee IL 61443*, [mbullock@theramp.net]; *Phil Imes WD9IRE, 908 Zang Ave., Kewanee IL 61443*, [kewphil@cin.net]; or *Bill Anderson WA9BA, 920 W Division St., Galva IL 61434*, [wa9ba@arrl.net].

SEP 25-28

SEATTLE WA Microwave Update 2003 organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25-28, 2003. Registrations for the joint conference will be accepted beginning April 1st. Cost of the registration will be \$40 prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be \$50. Registration forms can be downloaded at [www.microwaveupdate.org/] or send an SASE to *John Price N7MWV, 12026 81st Ave. NE, Kirkland WA 98034*, and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to *Microwave Update 2003*. Joint conference sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are \$69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at 425-337-2900. Be sure to mention "Microwave Update" to get this rate.

Continued on page 61

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The Good, the Bad, ...

The first half of March should bring a welcome improvement in DXing conditions, something that we haven't experienced in a while. However, the latter half of the month will be rocky, with a particularly poor stretch from the 14th to the 24th.

Look for a major flare or large CME around the equinox, followed within a day or so (if Earth-directed) by a strong geomagnetic storm. Good propagation will not return again until early April, but by then we should have a long stretch of decent conditions to look forward to.

This month marks the 100th anniversary of the first transatlantic daily "sked." On the 20th of March 1903, in concert with the London Times, Guglielmo Marconi established the first transatlantic news service between Glace Bay in Nova Scotia, Canada, and Poldhu in Cornwall, England. This ambitious project came only two and a half months after the first successful transatlantic radio message was transmitted, and just nine years after Marconi began experimenting with "wireless" telegraphy.

That first "commercial" broadcast station on Cape Breton was impressive, even by modern standards. The antenna array included four 200-foot wooden towers supporting miles of copper cables that covered approximately 500 acres. The crude "spark" transmitter was relatively powerful at 75 kilowatts, and the entire station was powered by its own coal-burning generating plant! In addition to the transmitter "shack," there was a home for the station manager and his family, plus several outbuildings to house various pieces of equipment. In size at least, Marconi's station was something any dyed-in-the-wool ham could fantasize about.

Unfortunately, Marconi's early attempt at establishing a regular international broadcast schedule was short-lived. Only three weeks later, on April 6, an ice storm brought down the huge antenna array. Although it was rebuilt, this event and other technical difficulties

March 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
						1 F-P
2 F	3 G	4 F-G	5 F-G	6 F-G	7 G	8 G
9 F-G	10 F	11 F-G	12 G	13 G	14 F-P	15 P
16 F	17 F-P	18 P	19 F-P	20 F-P	21 P	22 VP
23 F-P	24 F-P	25 F	26 F-P	27 F	28 F	29 F-G
30 F-P	31 F-P					

EASTERN UNITED STATES TO:																
Country	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Central America	(15-20)	(15-20)	20 (40)	x	x	x	(10)	(10)	(10-15)	10 (17)	10-15	12-20				
South America	(17-20)	20 (40)	20 (40)	(20-40)	x	x	x	(10)	(10)	(10-15)	10-15	10 (20)				
Western Europe	(20-40)	(30-40)	(30-40)	(40)	x	x	(15-20)	(10-20)	(10-17)	15-20	(15-20)	(20)				
Southern Africa	(17-20)	(20-40)	(20)	(20)	x	x	x	(10)	(10)	10 (15)	12 (17)	(15-20)				
Eastern Europe	x	(30-40)	(20-40)	(17-20)	(20)	x	x	(10-15)	(15)	(17-20)	(20)	(20)				
Middle East	x	(20)	20	(20-40)	(40)	x	x	(10-15)	15	(17-20)	(20)					
India/Pakistan	(17-20)	x	x	x	x	x	x	(15-17)	x	x	x	x				
Far East/Japan	(17-20)	(20)	x	x	x	x	x	x	x	x	x	(15)				
Southeast Asia	(17-20)	x	x	x	x	x	(17-20)	(10-15)	x	x	x	x				
Australia	(15)	(17-20)	x	x	x	x	(20-40)	(20)	(10)	x	x	x				
Alaska	(15-20)	(20)	(20-30)	(30-40)	(40)	x	x	(15-20)	(10-20)	(10-17)	15-20					
Hawaii	(15-20)	20	(20-40)	(20-40)	(40)	x	x	(15-20)	(10-20)	(10-20)	15-20					
Western USA	15-20	20 (40)	20 (40)	(20-40)	(30-40)	x	x	(10-20)	10 (20)	10 (20)	10 (20)	(15-20)				
CENTRAL UNITED STATES TO:																
Country	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Central America	(15-20)	20 (40)	20-40	20-40	(20-40)	x	(10-20)	10-20	10-20	10 (20)	10 (20)	10-20				
South America	(15-20)	17-30	20 (40)	20 (40)	x	x	x	(10-20)	10 (20)	10 (15)	(10-20)	12 (20)				
Western Europe	(20)	(40)	(40)	x	x	x	(15)	(15-17)	(15-20)	(17-20)	(20)					
Southern Africa	20	(20)	(20)	(20)	x	x	x	(10)	(10-15)	(10-17)	(15-20)					
Eastern Europe	(20)	(20)	x	x	x	x	(15)	(15-17)	(17-20)	(20)	(20)					
Middle East	x	x	x	x	x	x	(15)	(15)	(20)	(20)						
India/Pakistan	(17-20)	(15-20)	x	x	x	x	(15-20)	x	x	x	x					
Far East/Japan	(17-20)	(20)	x	x	x	x	x	x	x	x	x	(15)				
Southeast Asia	(15-20)	x	x	x	x	x	(20)	(10-20)	x	x	x					
Australia	(15-20)	(20)	x	x	x	x	(15-20)	(15-20)	15	15	15 (20)					
Alaska	15-20	(15-20)	20	20 (30)	(30-40)	(40)	x	x	x	10-20	10-20	10 (20)				
Hawaii	15-20	(15-20)	20 (40)	(30-40)	(40)	x	x	x	x	(10-12)	10-15	(10-17)				
WESTERN UNITED STATES TO:																
Country	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Central America	10-20	15-20	15-30	(14-40)	20-40	(30-40)	x	(15-20)	10 (20)	10 (20)	10 (20)	10 (20)				
South America	(10-20)	(15-20)	20 (40)	20 (40)	x	x	x	(10-20)	10 (20)	(10-15)	10 (15)	10 (20)				
Western Europe	x	x	x	x	x	x	x	(15-17)	(15-17)	(17-20)	(17-20)					
Southern Africa	(20)	(20)	(20)	(20)	(20)	x	x	x	x	(10-12)	12 (17)	(15-20)				
Eastern Europe	x	x	x	(17-20)	(17-20)	x	x	(15)	(15)	(15-17)	(17-20)	(20)				
Middle East	x	(20)	(20)	x	x	x	x	(15-17)	(20)	(20)	(20)					
India/Pakistan	x	(17-20)	x	x	x	x	x	(15-17)	x	x	x	x				
Far East/Japan	10-20	(20)	x	x	x	(40)	(40)	x	x	x	x	(10-20)				
Southeast Asia	(10-15)	(10-15)	x	x	x	x	x	x	x	(15-20)	(15-20)	(10-15)				
Australia	(10-15)	(15)	(17-20)	x	x	x	x	(15-20)	(15-20)	(15)	(10)					
Alaska	(10-20)	(15-20)	20 (40)	20 (40)	(30-40)	(40)	(40)	(40)	x	(10-15)	10-15	10-20				
Hawaii	(15-20)	20	(20-40)	(20-40)	(30-40)	(40)	x	x	x	(10-20)	(10-20)	15-20				
Western USA	15-20	20 (40)	20 (40)	(20-40)	(30-40)	x	x	(10-20)	10 (20)	10 (20)	10 (20)	(15-20)				

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

brought an end to the first commercial radio venture. Another six years elapsed before daily transatlantic radio communication became a reality.

In retrospect, it is amazing that Marconi met any success at all. Those early messages often took hours to complete successfully and had to be repeated many times. Reception was extremely variable, and although Marconi had at least discovered that his transatlantic transmissions worked better at night, the reason why was not understood. Solar effects were also unappreciated at the time, and to make matters worse, those first transatlantic broadcasts took place during the sunspot minimum at the end of Cycle 13. So, if you find yourself grumbling about propagation conditions later this month, think back on the incredible patience and tenacity of our first "DXer," and perhaps you will be inspired to hang in there.

Band-by-Band Forecast

10-12 meters

Good openings into Europe should be available before noon, and into Africa or the South Pacific after noon. The strongest "pipelines" will be to Central and South America from shortly after noon through early evening. Daytime short-skip will range from 1,000 to approximately 2,300 miles.

15-17 meters

Excellent worldwide propagation will be available to most areas of the globe from sunrise through mid-evening. Europe will open before noon and the rest of the world will be workable after noon. South America and Australasia may stay open until midnight during the best periods. Short-skip will average from 1,000 to 2,200 miles.

20 meters


Expect excellent daytime propagation but only fair conditions after dark. All areas of the globe should be workable on Good (G) days with peak periods coming for about two hours after sunrise and another few hours in the late afternoon or early evening. Europe should be particularly good from the eastern U.S. and the South Pacific, and Australia will offer excellent openings to operators in the western U.S. Short-skip can fluctuate between 500 and 2,300 miles.

30-40 meters

Good to excellent worldwide opportunities should be available from sunset to sunrise

despite rising atmospheric static. The Caribbean, Central America, and the northern half of South America will be particularly good, with New Zealand and Australia offering other decent opportunities. Short-skip at night will range from 500 to 2,500 miles but will be under 1,000 miles during the day.

80-160 meters

Fairly good worldwide DXing should be available from sunset through sunrise, but will be limited by atmospheric static. 80 meters will be substantially better than 160 except during the very quietest periods. Daytime skip will be very short — under 250 miles — but nighttime short-skip can range from 1,000 to 2,000 miles. 

CALENDAR EVENTS

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Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to *Jim Christiansen K7ND*, via E-mail at jk7nd@att.net. MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to *NU7Z* [nu7z@aol.com]. For presentations at the Pacific Northwest VHF Conference sessions, contact *N7CFO* at [n7cfo@ix.netcom.com]. LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice.

SPECIAL EVENTS, ETC.

MAR 22-23

OKLAHOMA QSO PARTY The Oklahoma DX Assn. will host the Oklahoma QSO Party, beginning at 1300 UTC on 22 March, and ending at 1300 UTC 23 March. All entries may operate 18 hours of the 24-hour time frame. Plaques awarded for high score(s). Certificates are available. For rules and info go to [www.qsl.net/okdxa]. 


ON THE GO

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Management Agency, the Red Cross, and the League itself. These references are all available on-line so you can check on a particular topic during the lesson and then jump back to the lesson itself. You can print out the learning units if you prefer to highlight key sections, or if your eyesight prefers paper and ink to a CRT. Once you are comfortable with the material, there is a student activity wherein you are given one or more questions or situations and asked to share your response with your mentor. I'd E-mail my responses and normally have a response back in just a few days. This activity sort of takes the place of a class discussion in a virtual world and fleshes out the material. After completing the student activity you can then move on to a series of questions to check your understanding of the material. Answer each question, then press a button under the multiple choice answers to check your answer.

When you finish all the learning units, you then can take the final assessment, which is a twenty-five-question multiple-choice test that reviews the entire course. I found it interesting that the material stressed focused as much on the people skills as the technical skills. This only makes sense because people tend to melt down in a crisis more frequently than equipment does. There are also sections devoted to net operations, message handling, and equipment choices. The course spends time on preparation for deployment, activation, and initial operations as well as how to shut the operation down. They even have a section on the importance of your own family and how to make sure they're provided for if and when you go. The material was useful, down to earth, and well presented.

Some suggestions if you decide to take this course. If you've been out of school for a while (and many of us have), get organized before you start. I chose to print the materials and keep them in a three-ring binder. If so, you may want to have space for your own notes, as well. Also, with exceptional reference materials available for download, you may want to either print them out for future reference or else burn them onto a CD-ROM and include it with your other emergency supplies. Most laptop or notebook computers now have CD-ROM drives, so this is an easy way to have reference materials readily available if you have to pack up and go.

This course was well worth the time and effort. If you plan on doing public service or emergency communications, you should give serious thought to taking this course. As I mentioned earlier, you may not always agree with the League, but they do provide some unique benefits. 

HOMING IN

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elements along the imaginary circle of movement is critical. A four-whip array must form a perfect square; an eight-whip array must form a perfect octagon, and so forth. Any error in element placement can cause significant bearing errors at some angles. If you use magnetic-mounts instead of a single fixed array-on-a-plate, be sure to use a template or make careful measurements when putting the mag-mounts on top of your vehicle.

That's enough theory for this month. In the next installment, I'll delve into practical Doppler antenna switching schemes. There are lots of circuits out there and some work much better than others. I'll explain why and describe some simple things you can do that may improve the performance of the one you're using now.

Duke City comics

Annually around New Year's Day, hams from all over southern California gather for a party in front of multiple TV sets, viewing stacks of videos they have taken at T-hunts of the past year. J. Scott Bovitz N6MI hosted this year's film-fest and the video I brought was a big hit, even though it wasn't about a local hunt. Here's why:

Our strange mobile RDF setups and hidden transmitter hunt rules seem comical to many non-hams, including news reporters. Some years ago, I took a columnist for our local newspaper on a hunt ride-along. The story she wrote made it clear that the humorous aspects of the event made a much greater impression on her than my explanations of T-hunting's serious enforcement and search/rescue value.

The T-hunters of Albuquerque have had similar media encounters, so they decided that if it is something to joke about, they might as well make the most of it. When comedian Dave Attell came to Duke City last June to videotape the city's nightlife for his weekly show on Comedy Central cable/satellite channel, they put on a special late-night T-hunt.

As a result, Attell's "Insomniac" Albuquerque episode includes a hilarious segment on mobile T-hunting, as Dave rides along with Mike Pendley K5ATM and Debbie Pendley KD5LOK in their Doppler-equipped van. Waiting for the hunters on a mesa above Petroglyph National Monument beside his T-in-a-bush is Jerry Boyd WB8WFK. It first aired last December and is expected to be repeated in the coming months (check listings at [www.comedycentral.com]).

Congratulations to the T-hunters of Albuquerque for showing the humorous side of our sport to the whole country. What publicity has your club gotten for RDF contesting in your area? Send E-mail or postal mail to the addresses at the beginning of this article and tell me about it. **73**

QRH

continued from page 7

PHONESIA (fo NEE zhuh), n. The affliction of dialing a phone number and forgetting whom you were calling just as they answer.

Thanks to the UBET ARC newsletter Radio Flyer, April 2002.

And then there's MUSTURD (MUSS terd), n. That hard little cap of old stuff that forms at the top of a squeeze bottle of mustard. — *ed.* **73**

NEVER SAY DIE

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do is turn on a switch and the whole world is my oyster. I turn off the switch and I'm alone to read, think and write. But if I get lonely, I've got a bunch of friends all around the world waiting there for me.

Okay, how can we get the grays into our hobby? That's easy. Start writing articles about the fun you're having on the ham bands for your local shopper paper. Tell 'em how easy it is to get a ticket these days and how little it costs to get a used ham rig. Invite 'em to a club meeting. Offer to help 'em put up an antenna.

If we can't get the kids, let's go for their grandparents.

Danger — Blasting

We've all seen the signs asking us to turn off radio transmitters when passing blasting areas. Well, a reader sent me a download from newsmax.com of an article recommending that Israel set up narrow passages at every checkpoint with sandbags to absorb any explosions and UHF transmitters which would detonate any blasting caps Palestinians might walk or drive through with. That would get rid of suicide bombers in short order.

If we set up a system like that at airline check-ins we might blow the feet off some shoe bombers.

That got me to thinking — and I can prove it.

How about using a psychological approach? I'd set up a series of radio and TV broadcasts in Arabic of psychics interviewing dead suicide bombers who

are screaming that they are roasting in hell and that all that crap about they're having 73 virgins and living in paradise are just terrible lies. Allah is furious with them and has put a curse on their families.

I've always felt it's far better to outsmart enemies rather than to try and outfight them. It's cheaper and saves a lot of lives.

Rife = Bunk

If you haven't read Barry Lynes' *The Cancer Cure That Worked*, the book about the work of Dr. Royal Raymond Rife, you've missed a fascinating story.

Rife is the guy who, back in the 1920s, invented a super powerful microscope. Like Béchamp before him, he heterodyned two ultra-violet lights to produce a visible light magnification that allowed him to watch live bacteria in action. But he made the serious mistake of curing some of his patients of cancer. For this error he was arrested, his microscopes destroyed and he was put in prison. It's the good old American way. At least, he didn't die there as did Dr. Wilhelm Reich—whose equipment was also destroyed.

So where's the bunk?

Rife was using a radio frequency generator, which he supposedly "tuned" to frequencies which blew bacteria apart, with each requiring a different frequency. So today we have so-called Rife frequency generators which are selling in the multi-kilobuck range.

So what's wrong with that? Why do I think this is bunk?

Firstly, I've read everything I could find about Rife's work, looking futilely for some hint as to the frequencies he was using. Plus, it seems to me that if one is going to blow up a bacteria one is going to have to use one heck of a high frequency to get a half-wavelength down to microbe size. With 1920s technology? When I got started building radios in 1937 the ham ten-meter band was considered an ultra-high frequency experimental band.

The second problem was stability. You either used a crystal in an oven to generate a stabilized frequency or your signal wandered around as your coil heated up and cooled. Even temperature-controlled ovens were crude by today's digital generator standards. So how could Rife have known and achieved a frequency accuracy which targeted a specific pathogen?

Third, this was way before accurate frequency counters. There was no way to accurately measure frequency.

Fourth, cancer isn't caused by bacteria anyway. It's caused by faultily reproduced cells not being trashed by the immune system and thus being allowed to

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$10 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively - once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

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Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry; Schools in 2020: another \$ trillion industry; Anthrax, a simple cure. Dowsing: why and how it works. \$3 (#86) My 1992 *We The People Declare War! On Our Lousy Government* book—360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need: *NASA Mooned America:* René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was \$7. I found a few in the warehouse. \$3, while they last. Great book! (#83)

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Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the May 2003 classified ad section is March 10, 2003.

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NEUER SAY DIE

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grow out of control. With around 24 billion cells having to be replaced every day, an impaired immune system can miss trashing a few reproduction errors — and the result can be deadly. The only practical cure I see for cancer is to rebuild one's immune system. This is the route promoted by Drs. Day, Comby, Bieler, me and a few others.

So, as far as I can see, those expensive so-called Rife frequency generators are just one more alternative health fraud.

Writing

I lucked into a wonderful book at one of those New Hampshire yard sales. It's *Write From the Start* by Donald Graves, a 1985 paperback. One of the best quarters I've ever spent.

The idea is to encourage young children to start writing. Give 'em a pencil and paper and see what happens. Young? Many kids get started writing at three or four, even before they've learned to read, and they love it. A group of teachers at some New Hampshire schools let their children write about anything they wanted, and never mind marks for spelling, grammar or punctuation — or anything else. They're encouraged to do it because it's fun.

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QRX . . .

UK Ticket Changes

The amateur radio license structure in Great Britain is currently undergoing a major shakeup. There are currently 5 classes of amateur license dependent upon skill level and Morse proficiency. The callsign prefix denotes license class and geographical location within the UK.

The lowest class is the Foundation license. This requires a very basic knowledge of electronic theory, license conditions, interference avoidance and

operating practices. The ability to recognize Morse code is required, but no significant proficiency in sending or receiving. This gives access to all bands except 10 meters with a maximum power of 10 watts. The license is obtained by attending a weekend or evening training course. The callsign is in the form of M3XXX.

The next license class is Intermediate. This requires a more in-depth knowledge, plus the building of a

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Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article (IBM (ok) or Mac (preferred) formats), carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

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Wise Up & Beat the Odds

NEVER SAY DIE

Wayne Green W2NSD/1

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What a Waste!

Those lives of the seven *Columbia* occupants, I mean. The major media had a field day interviewing the grieving parents, but with not one word asking the real question ... why were those seven people up in near-Earth orbit? Do you know what they were doing up there? Have you a clue?

Being contrarian, I compare NASA's loss of seven people to what I consider the AMA's murder of several thousand Americans through what the law calls depraved indifference, just during the brief *Columbia* media therapized bathos flurry. And I don't think I'm exaggerating.

This whole space thing started back in 1957 when the Russians lofted *Sputnik*. This was when our rocket scientists were blowing up our rockets on the launching pads one after another. So we imported Wernher von Braun from Germany and managed to get *Explorer* into orbit. Then we heard that Yuri Gagarin was the first man in space. The later news that this was faked still isn't well known. But the news got newly elected President Kennedy upset. We must be the first to put a man on the Moon!

Our launch of Alan Shepard for a 15-minute space trip was a start in *Freedom 7*. NASA was on its way with around \$400 billion in today's dollars from Congress for the Moon project.

After contractor Rocketdyne's repeated failures to build an engine with enough power

for the Moon trip, the scenario I see was that the NASA brass had to either give up and everyone go home or go to Plan B. The eleven astronauts who didn't want to go along with B were soon eliminated through a series of "accidents." Plus one journalist who got too nosy also had to be eliminated (along with his wife and step-daughter).

As Nixon said later, "Just think how miserable it would have been if we had not had the space success when we were in the midst of Vietnam, then Watergate and all that."

We pulled off the Moon landings in the early 1970s using mostly 1950s technology.

What was NASA to do next? Nobody wanted to let go of the government teat, so they came up with the Shuttle.

On balance the Shuttle has been a huge mistake. The Shuttle was supposed to be safe, reliable, and be able to make a round trip every week at a cost of \$10 million each, replacing disposable rockets, and paying for itself by putting satellites into orbit.

The reality was an average of five trips a year at a cost of \$500 million each, while most of the satellites were still being lofted by Europe's Ariane single-use rockets.

But what about the boasted scientific experiments the Shuttles would make possible? The American Physical Society's Robert Park has said, "There is no experiment that has been done on the space shuttle that has made a significant difference to any field of science."

The Shuttle, a marvel of 1970s engineering, has been a hugely expensive bummer ... scientist and space industry welfare. And ditto the space stations. Hundreds of billions pffft. Hmm, let's see ... every billion Congress blows on waste like this means \$1,000 of your tax money.

Any complaints?

By the way, all of our orbiting satellites and the Shuttle trips have been in near-Earth orbit, well below the Van Allen Belt.

As John Carey said in the Feb. 17th *Business Week*, "...there's not much reason to keep the space station in orbit, except as a destination for the shuttle, and the shuttle has little utility but to ferry astronauts to the station." At \$500 million a whack?

Enter Jim McCanney

Jim is one of NASA's worst headaches ... a solidly credentialed scientist who refuses to toe the NASA secrecy line about the effect comets and Planet-X have had on the Earth in the past. Wait'll you read his book, *Planet-X, Comets & Earth Changes*. ISBN 0-9722186-0-2. It's an \$18 book and I've laid in some copies for Radio Bookshop (item #95), just in case you're interested in finding out more about how the government is lying to us.

Why all the lies? Well, what would you do if you knew that there's a good chance that every city on our coasts could be wiped out in a matter of minutes by a passing planet or comet? It would cause a panic beyond description.

Planet-X, also known from ancient records as Nibiru, as described by Zacharia Sitchin in his superbly researched books, and called Wormwood in the Bible, has a long history of creating havoc on its passes through the solar system.

Like? Sudden mountain building due to the gravity effects on Earth's mantle, shifting the tectonic plates around. Jim says our oil deposits arrived from a comet tail, not from decayed prehistoric plants, and that there's a lot more to be found.

What's the real story on the arrival of Planet-X? I wish I knew for sure. Mark Hazelwood, in his *Blindsided*, makes a good case for it passing by this spring, complete with a sudden pole shift (it's \$15 from Radio Bookshop, #94). Nancy Lieder (zetatalk.com) says it'll be May 15th, but the strong suspicion by several experts is that this is a NASA disinformation ploy.

The AMA at Work

Have you read about Dr. Semmelweis, the Hungarian physician? He's the doctor 150 years ago who was concerned over the terrible death rate of women who gave birth in hospitals compared to those using midwives and giving birth at home. He noticed that doctors assisting births had often come directly from doing an autopsy to the maternity ward without washing their hands. When he got his hospital to have the doctors wash their hands before

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radio receiver either from a kit or locally purchased components. The Intermediate license is available either as a Class A with Morse, or a Class B without Morse proficiency. Class A gives all bands with a maximum power of 50 watts and Class B gives all bands above 30 MHz at 50 watts maximum. Callsigns are in the M5XXX or 2E0XXX for Class A and 2E1XXX for Class B. As with the Foundation, a training course has to be attended to get the license.

The top (and original) license class is the Full license, again, available as Class A or B. The level of technical knowledge is broadly equivalent to the US Advanced class exam. The Morse requirement is to send and receive at 5 WPM. The maximum power levels are 400 watts PEP or 150 watts carrier. You will hear callsigns with G2XX, G3XX, G4XX, G5XX, G8XX, G0XXX, G2XXX, G3XXX, G4XXX, M0XXX for Class A, and G1XXX, G6XXX, G7XXX, G8XXX, M1XXX for Class B.

The callsign prefix may include a second letter if the station is not located in England, e.g., GW3 is in Wales, MM1 is in Scotland, 2U1 is in Guernsey, GJ8 is Jersey, MD3 is Isle of Man, and GI8 is Northern Ireland.

For a club station at a public event these second letters would be X for England, C for Wales, S for Scotland, P for Guernsey, H for Jersey, T for Isle of Man, and N for Northern Ireland. GB prefix calls are special event stations, GB3XX calls are repeaters, GB3XXX are beacons, and GB7XXX are packet nodes and BBS stations. Repeater, beacons, and packet BBS stations all require their own licenses. Nothing's simple in this country!

The UK Morse test is more challenging than in the US. A 5-minute passage in QSO format has to be received with no more than 6 errors and sent with no uncorrected errors whatsoever. Whilst Morse tests and Foundation courses are administered by clubs, the exams required for the Intermediate and Full license are administered by a national examinations body twice yearly.

Copy that, ol' chap?

Thanks to Nigel Gunn G8IFF, via the February 2003 issue of RF-Carrier, a monthly publication from The Dayton Amateur Radio Association.

RC Mag-Lift Train Takes Off ... Well, You Know What We Mean

The world's first magnetic levitation or mag-lift passenger train began running in Shanghai, China, on January 1st. The radio-controlled train reached 312 miles per hour in testing. In regular service it will carry passengers and freight at a

top speed above 250 miles per hour between Pudong International Airport and Shanghai's financial district. The distance is 30 miles, and the trip will take a mere 7 minutes — not even enough time to make a quick cell phone call.

Thanks to Technology Online, via Newsline, Bill Pasternak WA6ITF, editor.

Edison and the X-Ray

Thomas Alva Edison was well known as an inventor of many things, but usually not the X-ray.

However, he did experiment with X-rays at great length. He secured more than 1,000 patents but never did he patent his X-ray devices. Yet mankind will long benefit indirectly from his many experiments and from tests made in his laboratory.

He said in an article he wrote for *Popular Mechanics* in 1903, "You cannot obtain energy without first supplying it from some other source." He believed that radium, thorium, and uranium were not energetic in themselves, but were made radioactive or fluorescent by the introduction of other energies.

His speculations were eventually replaced by Einstein's theory of the equivalence of mass and energy. Edison upheld Einstein's theory and based his experiments on this theory. Other researchers and entrepreneurs were conducting isolated experiments, but Edison had at his command the financial, human, and physical resources to make short work of long, tedious research.

William Randolph Hearst, editor of the *New York Journal*, sent Edison a special request. X-ray a human brain and send him the pictures. Edison believed physicians would find an instantaneous image of the human interior far more useful than an image on a plate, so he set out to build a better X-ray device. His lab conducted exhaustive tests on glass, vacuum, electrodes, and energy sources, to produce the best X-rays. In 1896 alone, his lab tested more than 8,000 substances.

The best brightness came from calcium tungstate. The result was that Edison improved what is now known as the fluoroscope, used to this day. He could not patent it because he was not the original inventor.

Although Roentgen first discovered the X-ray and the fluoroscope, it was Edison who put it on the market. Less than three months after Roentgen's announcement, Edison's fluoroscope was available for purchase on the open market at a low price. Edison also achieved his goal of producing a completely portable X-ray outfit, and Edison Portable became the Navy's first shipboard X-ray unit in 1898.

Despite the ray of hope he provided to medical science by radioactive substances, Edison experienced its dangers. "I am through with X-rays,

radium, and everything of the kind" he said in 1903. "Not only is my left eye badly affected by the Roentgen ray, but I am having all kinds of trouble with my stomach due, I believe, to leaning over the X-ray machine while experimenting."

Roentgen went on to win the first Nobel Prize in physics in 1901 for his discovery. Edison? He wrote an article about it for *Popular Mechanics*.

So the next time you come across the notion that Roentgen was the sole developer of X-rays, you'll be able to see right through it.

Thanks to the December 2002 issue of The Modulator, the news and views of the Fort Myers Amateur Radio Club, Inc.

TV Guide

According to the National Association of Broadcasters, approximately eighty-one million television sets in the U.S. receive programming exclusively from free, over-the-air TV stations. In comments filed with the Federal Communications Commission, the NAB noted that while the total number of television sets in the U.S. is 267 million, more than three out of every ten TV sets relies exclusively on "free TV" for programming. This means that the TV set is not hooked up to cable, satellite, or any other subscription TV service.

Other figures noted by the NAB say that twenty-five percent of all cable and satellite homes have at least one TV set in the household that receives signals solely from free TV. Also, 24 percent of African-American and 32 percent of Hispanic households rely exclusively on free TV for their television viewing.

The National Association of Broadcasters analysis was provided to the FCC as part of the Commission's "Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming." The NAB says that its comments demonstrate the considerable extent to which consumers still depend on over-the-air broadcast television signals.

Thanks to the NAB, via Newsline, Bill Pasternak WA6ITF, editor.

Hackaround is Fair Play

We have all heard the expression, "Turn-around is fair play." One person who has just found that out is former computer hacker turned on-line security expert Kevin Mitnick N6NHG. That's because Mitnick's new company Web site has been — well — hacked.

The ham who holds the honor of being the world's best-known computer hacker suffered the indignity of having hackers break into his new security consulting company's Web site — twice. But news reports say that Kevin Mitnick N6NHG simply shrugged off the incidents as amusing,

and not serious enough for him to call authorities to investigate.

Two electronic break-ins took place. The first was on January 30th. In that one, a hacker calling himself "BugBear" added a page to Mitnick's corporate Web site that read "Welcome back to freedom, Mr. Kevin." This is probably a reference to Mitnick's probation, which had ended ten days earlier on January 20th. During his probation, Mitnick was barred from accessing the Internet, and this hack may have been more of a welcome home—in this case, home being the World Wide Web.

The latest incident took place over the weekend of February 8th and 9th, and was more of an on-line job application than a hack. In this case, a hacker in Texas broke in and asked Mitnick to hire him as the company's security officer.

Mitnick says that the hackers apparently exploited separate flaws in Microsoft's Internet server software. He says that the person responsible for the company's Web site failed to install patches available from Microsoft.

In neither instance did hackers vandalize the Web site. One said in an E-mail that he didn't do damage out of respect for Mitnick.

Mitnick's new organization is called Defensive Thinking, and it is located in Los Angeles. A company spokesman said that no customer

information was released nor was there any danger of information being compromised.

Thanks to Bruce Tennant K6PZW, via Newsline, Bill Pasternak WA6ITF, editor.

Spanning the Atlantic — and Above

Here's a story of history being celebrated — of the earliest days of radio being commemorated by the people of the 21st century. Those who were there said it was like the past catching up with the future on a cold day on Cape Cod, Massachusetts.

The event was the 100th celebration of the first-ever radio transmission from the United States being received in Europe. It was made by radio pioneer Guglielmo Marconi in 1903. And it was his daughter, Princess Elettra Marconi, who lent her voice to begin the 100th anniversary celebration of the first trans-Atlantic radio message.

She began the festivities in a brief contact with Ken Bowersox KD5KBP. That's Commander Ken Bowersox on board the International Space Station. A bit later, Bowersox spoke with Cape Cod area school children who asked questions about life in orbit. Both contacts were made possible by ARISS — Amateur Radio on board the International Space Station.

The January 18, 1903, contact by Guglielmo Marconi used an early form of hand-sent code to span the Atlantic. A short time later, Marconi predicted that man's voice would eventually span the globe using wireless. Now, precisely a hundred years later on a frigid January 18, 2003, Marconi's daughter returned to near the scene of that first contact and got to speak to a man in space. If he were alive today, Guglielmo Marconi would justly be proud.

Thanks to Bob Doherty K1VV, via Newsline, Bill Pasternak WA6ITF, editor.

New Class of Field Day Station

Amateur Radio's premier emergency preparedness operating event is changing. This, with word that the annual ARRL Field Day will gain another entry class for 2003.

Called Class F, these will be amateur radio stations which are set up and operate from emergency operations centers, or EOCs. The ARRL says that the change renews the emphasis of Field Day's 1933 origins as an emergency preparedness exercise as opposed to a routine contest.

Thanks to the ARRL, via Newsline, Bill Pasternak WA6ITF, editor.

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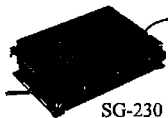
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Illustration from the original SGC Martine SSB Notebook, 1974

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NEVER SAY DIE

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assisting a birth the death rate fell from around 30% to almost zero.

The medical establishment reacted by cutting off his research funding, launching a vilification campaign and getting him fired.

In America the AMA followed suit by threatening to remove the license of any doctor caught washing his hands. Since they couldn't see germs, the belief in them was crazy. Superstition. It was almost 50 years and millions of unnecessary deaths before doctors were able to wash their hands in public before operations.

Little seems to have changed.

Diapers

The average baby uses up to 10,000 diapers by the time conventional toilet training is done. That comes out to about 20 billion disposable diapers for American kids a year that are being buried in landfill ... where it takes an estimated 500 years for them to biodegrade. That's around \$4 billion a year spent on disposable diapers.

Then there's cloth diapers, which eat up lots of electricity and water, and use tons of polluting chemicals being washed.

Some five million tons of disposable diapers go into U.S. landfills every year. This takes one billion trees a year, plus uses 3.5 billion gallons of oil in the manufacture.

All because American parents haven't bothered to learn how to toilet train their baby the easy, fast way. I'm talking within weeks of birth. I'm talking about a baby that doesn't make "mistakes" and is a lot happier than one carting around a load for hours.

Check out Laurie Boucke's *Trickle Treat*, if you can find a copy. ISBN 0-9625006-2-3. Try abebooks.com. That's where Sherry got a copy recently to give to my daughter Sage, who's having her first baby soon.

Toilet training can be accomplished within a few weeks of birth just by paying attention to the baby's natural elimination patterns ... like when it wakes up, after meals, before it goes to sleep and any time it begins to fret. It can be done positively and with no recriminations. A baby is happy when it's making Mother happy by cooperating with toilet training. It's a win-win situation which will avoid years of diapers and cleaning the baby's bottom ... and avoid possible long-term toilet problems.

Early-on the baby can be taught to make a distinctive sound or give a sign when it's ready to go. Just make that sound and give that sign every time you help the baby to pee, and another signal for a bowel movement. Read the book *Baby Signs*, which is reviewed on page 43 of my *Secret Guide to Wisdom*.

We really don't need more generations of constipated people.

A New Scam

This is a great one! It starts out when you receive a \$4 check in the mail. It doesn't say what for on the front, but on the back in teensy type it says over your signature: "Please send me an XXXX Savings Card and Kit as soon as possible. Cashing this check activates my membership to XXXX with all privileges included. I understand that after 30 days, the \$139.95 annual fee will be automatically charged to my credit card account on file. To ensure continuous service each year, XXXX will be automatically renewed at the then-current renewal rate and charged to my credit card account on file. I may cancel at any time for any reason and receive a pro-rated refund of my then-current paid annual membership fee. The \$4.00 check is mine to keep regardless." Signature _____.

Union Theft

While our notoriously liberal media made big headlines over the plundering of Enron,

et al., I'll bet you didn't see a word about the plundering of the Washington (DC) Teacher's Union by union President Barbara Bullock and a couple other officials. They are suspected of embezzling more than \$2 million of the member's dues (which are compulsory).

The FBI investigated and the list of Bullock's spending of the union funds as reported in a January Michelle Malkin newspaper column is staggering. \$20,000 mink coats, \$500,000 in clothing from Van Style, \$150,000 from Neiman-Marcus, a \$57,000 sterling set from Tiffany, \$40,000 from Saks, \$50,000 from Nordstrom, etc. It's a long list. Gee, what a surprise!

Damned Liars

All the histrionics about giving the rich a tax cut is crapola by either liars or the monumentally stupid. Both Kennedy and Reagan put through tax cuts and those gave us years of prosperity. Why? Because it's the rich who are making most of the money ... and paying the highest taxes. When the "rich" get a tax cut do they sit in their vaults like Scrooge McDuck and wallow in their money? Of course not.

Our country and the world are on a never ending escalator of inflation, so any money that isn't invested somewhere or spent rapidly loses its value. The rich spend or invest, and either of those paths creates more jobs. The stuff they buy has to be made, advertised, sold and serviced. Their investments make it possible for more businesses to get started or grow.

The rich? If your household income is over \$83,500 you are one of the "rich." You are in the top 20%. That's a couple making a little over \$40,000 each. If your income is \$150,000 you're in the top 5%! Wow! But you're not going to be buying any Rolls or yachts on that.

Both the Kennedy and Reagan tax cuts far more than made up for themselves by the increased tax revenues

which resulted from the increased business growth.

Instead of being jealous of the rich, why not become one of them. Once you get over the "job" mentality and start thinking in terms of starting your own business you'll be making money for yourself instead of someone else and you'll be amazed at the freedom you'll have ... and you'll have the money to enjoy it. It's all in my *Secret Guide to Wealth*.

The next time you hear a politician braying about tax cuts being for the rich, give the jackass a Bronx cheer. Say, isn't a jackass the symbol for the Democratic Party? Coincidence?

How to Kill a \$100,000,000 Goose!

Byte, once the largest magazine in America (maybe the world), died a quiet, almost unnoticed, death a couple years ago. Well, since the magazine was my brainchild, I noticed.

In January 1975 a tiny company, MITS, in Albuquerque, brought out a kit for hobbyists to make a computer. The Altair 8800 was designed around the new Intel 8080 chip. Since MITS had been advertising their four-banger calculator (\$129) in 73, I quickly bought an Altair kit and put it together. The only input was some toggle switches on the front panel, and there was zero software.

Next I bought a keyboard kit from Southwest Technical Products (SWTPC) in San Antonio and put that together. Neither MITS nor SWTPC could help me connect the keyboard to the computer, so I had to figure that out for myself.

One thing I didn't know was that Ed Roberts, the president of MITS, and the designer of the Altair, had never actually made it work. I discovered later that he expected hobbyists to figure out what was wrong and let him know so he could ship units which actually would work. Which they did.

Having watched the computer industry start with mainframe million-dollar computers made by IBM, Honeywell, RCA and a few others, and then grow enormously when Wang, Data General, DEC and others weighed in with minicomputers in the \$100,000 range, I saw the potential for growth for microcomputers which could bring the cost of computers down to \$10,000 and under.

Hmm, I decided I had to start learning about these contraptions. So I bought all of the computer books I could find and started reading. But I couldn't understand them! They were all college texts. Hey, there's going to be a need for thousands of newcomers to computers to learn about them ... something that explains them in simple language. A magazine.

Having recently turned an amateur radio hobby of repeaters from about a hundred in the country in 1969 into the biggest ham radio activity in the world with thousands of repeaters with 73 magazine and my *Repeater Journal*, and watched the hobby then be used to launch the cell phone industry, I knew the power of a magazine to help a new technology grow into an industry.

A magazine, I discovered, makes it so the pioneers in a new technology are able to communicate and thus speed up the technology's development. Further, it attracts newcomers to the field and brings them up to speed. It also attracts entrepreneurs who start making products in this field and are easily able to reach their potential customers. And that attracts more people, etc.

Okay, there's a need for a basic computer magazine. Since I didn't know squat about computers, I needed an editor. I started calling the editors of computer hobbyist newsletters, looking for an editor. Most weren't interested. Hey, it's just a hobby. I finally found one that agreed to give it a try. Now what?

I needed articles, subscribers, and a simple, catchy name. I came up with *Byte*, which said it all.

I called every company even remotely connected to computers. I outlined my plan and asked them to recommend potential authors and send me a list of anyone who had written for information.

I called the 73 authors who had written computer-oriented articles, asking them to get busy and submit articles to *Byte*.

Five weeks after my decision to start *Byte* the first issue went to press!

The new editor helped, but most of the work was done by the 73 staff. And me. I designed the logo, wrote the subscription letters, called potential advertisers, and a thousand other details.

The subscription mailing responses were amazing. Normally one expects about a 2% response. I was getting over 20%. I called the ham stores who were selling 73 and most of them signed up as dealers for *Byte*. We were off and running.

The Altair was announced in January. I started *Byte* in May and the first issue went to press in early July. The first copies from the printer arrived in August with a September 1975 cover date. I immediately flew out to visit MITS to

Say You Saw It in 73!

bring Ed Roberts magazine copies and solidify our advertising contract. I also visited Sphere in Salt Lake City, which had a Motorola 6800 chip-based system they were introducing. From there I stopped off in Ft. Worth to visit a company

Continued on page 26

Two Step Tuning

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Right Fancy CPO

A keyer from My Kid Brother.

The CPO, a/k/a code practice oscillator, has been a part of amateur radio for quite a long time now. I have no idea when the first one was built, or who built it for that matter. The fact remains, however, that the "code practice oscillator/CPO" has remained much the same since its inception.

The main — the only — purpose of the code oscillator is to provide a means of keyed on-off tones. Once CW is well mastered, the CPO is really of no further use!

CW comes in two parts: transmitting, and receiving!

Learning to receive is only half of the CW-learning experience. We are told that a dash is three times longer than a dot. The time interval between a dot and a dot (or a dash and a dash) for the letter "I" (or "M") is equal in time value to the length of a dot.

OK! Fair enough! So how do you measure that length of time? If you hold a dot for a given length of time, how do you know that you are holding the dot long enough? How do you know, for that matter, that the dash you send next is three times longer than the dot? Or too short maybe? Or even too long?

While learning to send CW in preparation for my Novice test, it occurred to me one day that learning to send CW has a lot in common with learning to play music — and the playing of music is a motor skill. CW sending, also like music playing, is a "motor skill," too. It uses only one tone, so unlike with music, you don't have the

dimension of "pitch" to deal with. However, as with playing music, you are dealing with sensing time (musicians call it a time feel)!

Developing a time feel in playing music is facilitated by practicing with a metronome, and practicing for an incredible amount of time (more than you want to know)! While I was working one day with a metronome, it became obvious to me that a note had to be held accurately for a given interval of time in music, in much the same way (in CW) that dots and dashes have to be "time accurate."

There are many different length-of-time notes in music, but only two different "note lengths" in CW — the dot and the dash (the verbal use of dit and dah bear witness to that fact). Well, you can't very well adapt a metronome to help in learning the sending of CW. However, playing a musical instrument, such as the bass fiddle, is a motor skill. Sending, the playing of, CW, is a motor skill also (although nowhere near as involved as playing the bass fiddle).

So the techniques that I used in learning to play music, modified, will work for the learning of CW "playing." This CPO, I believe, fills a void

in learning CW that has been there all along — that is, until now.

Back when I was in high school, a fellow student, David T. Holmes Jr. W8UMP, was two years ahead of me and had his General class license. He became my friend and amateur radio mentor. Dave volunteered his time, expertise, and patience (if you're out there Dave, thanks!) to teach me the necessary code and theory in order for me to pass my Novice test.

One day, while struggling with the code, it occurred to me to handle the task the same way as though I were learning to play a new piece of music, as already mentioned. Just practice the sending of CW the same way. Practicing, being patient, and persevering are also key ingredients in learning to play music. Remember, this CPO is for learning how to transmit CW. I know that there are those out there who have learned to receive the entire CW alphabet, numbers and punctuation, in under 150 microseconds — nice going! Transmitting CW, the other half of the CW communicating system, however, is another story.

Over the years, every now and then, memories of my Novice license preparation days come back to me —

particularly when I hear amateurs say that "musicians have the edge when it comes, to learning CW." If they do, I believe I can take the mystery out of it. The "edge" can be summarized by these three words: practice, patience, perseverance!

There, is a "rhythm to the code." it is said. In a manner of speaking, rhythm could be likened to the mirror image of timing: a time feel, which is akin to rhythm. The metronome is a mechanical device that could be thought of as a "time mark generator" used by musicians. It generates clicks (or pulses), signals if you will. The pulses/clicks are used to help in the development of a sense of rhythm because they occur on an accurate, regular basis.

A time sense, or time feel, is very important in playing music. It is equally important in sending CW. In music, some notes are long, (just as there is slow CW), and some notes are short — for instance, CW sent at 50 words per minute or more has a lot of short notes! So how much of a difference is there between a long note (dash) and a short note (dot), at any given speed? How do you learn to send/play the particular CW (dot, dash) character/note for the correct length of time, initially, and consistently thereafter?

Music teachers say that "a quarter note gets one pulse" (some teachers also say beat instead of pulse). What this means is that you start a note, and you hold that note for a measured interval of time, and you release. When practicing with the metronome, you start the note simultaneously with the first click, and hold the note till the second click occurs, and simultaneously release the note with the second click (golly, that's a lot like sending a dot in CW, isn't it?). Start the note with the first pulse, hold it, and release with the second pulse! Simple, isn't it? That note (time interval value-wise) is a quarter note. A half note is twice as long as a quarter note. You start the note with the first click of the metronome, and hold it till the second click occurs, and continue to hold it till the third click occurs, and simultaneously release (see the timing diagram). The note that is held twice as long as the

quarter note is called a half note. A half note is twice as long as a quarter note.

"OK, so how do I get a dash out of all of this?" you say. Well, note time lengths can be combined, or linked (musicians say tied). If you start with the first metronome pulse, hold it for the second pulse, continue to hold though, and release with the fourth pulse, you have a quarter note "tied" to a half note (in music it would be indicated as a half note with a dot beside it). If you link quarter and half notes, and analyze by counting clicks (without any separation), it adds up, clickwise, to four counts the time length of a dash.

There it is, analyzed. A dot, and a dash, which is three time intervals longer than a dot (notice the time indicators on the timing diagram). You can get a better understanding of what this is all about, with your fingers. Place your hand palm-down on the table, fingers spread. The fingers, represent clicks, the space between the fingers represents, "the 'on' time interval." The space between the index and second finger is the "interval" of a dot. You can animate a dot by tapping first the index finger, then the second finger (hum or whistle between taps). If you do that, you have a somewhat crude but accurate representation of a dot time length.

As was said, two clicks on a metronome result in a dot, time interval-wise. A dash is done in a similar manner, but notice that you need to add up the time interval spaces between the fingers. That turns out to be a "four count" on the fingers, or four pulses of a metronome. Start by tapping the first finger, and start humming and holding the hum until you tap the fourth finger — that's the length of a dash! This CPO transitions from the time marking aspect of a metronome to the generation of accurate-length-of-time tone intervals. Marking time, without time marks. Marking time-interval lengths by generating measured tones is what this fancy code oscillator does. When keyed, a tone stays on for a measured time interval. If you don't hold the key long enough, the dot/dash you send will end too soon. If you hold

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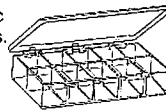
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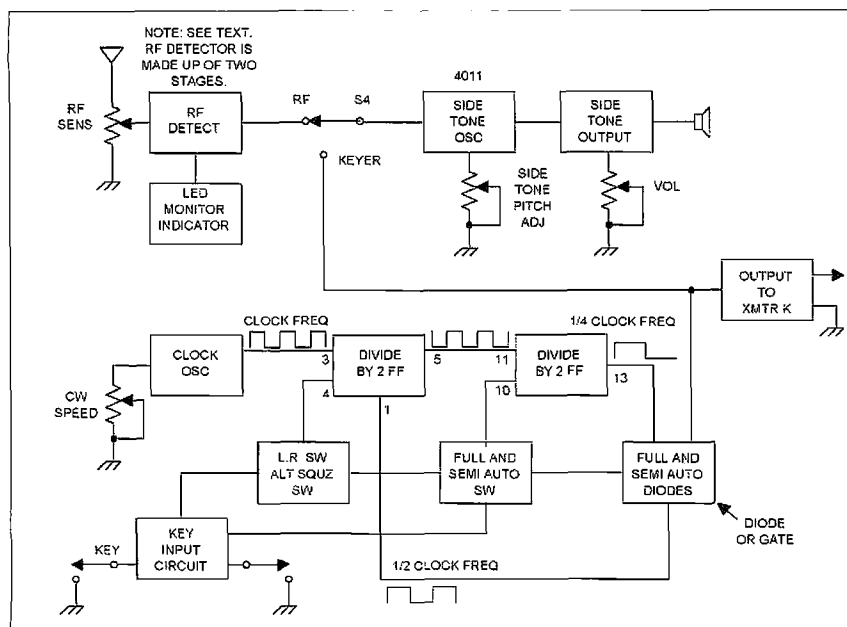


Fig. 1. Function block diagram.

the key too long, the dot/dash will end in the correct amount of time, and possibly the next dot/dash will start. You could say that this is dissecting CW, and looking at it under a microscope. I guess it is; however, this is done with the eventual goal of acquiring good CW sending technique. An important thing in operating CW, don't you think? This code oscillator generates the tone between the "time mark" clicks, and in this way helps you develop a sense of CW rhythm.

This fancy code oscillator is more than just another "pretty face." For instance, it can be used for both full and semi-automatic keying. It has a provision for right-left-hand keying, squeeze/alternate keying. It also incorporates an RF keying monitor, with an LED indicator.

It can be used as a tutor to help in learning to use a "bug" or "straight key." The keying speed can be adjusted from below 5 wpm to over 50 wpm. It can key any transmitter. The right-

left-hand switch was added thanks to my old Air Force buddy Dan Coyle of Dayton, Ohio. Dan is a leftie. He pointed out that the original was for the exclusive use of right-handed folks, so a right-left switch was included.

Using this CPO "forces" you to be CW-honest! Because the dots and dashes are not self-completing, you can't speed up or slow down, or short-change the time length of either dot or dash. You send good CW. That's why this CW-transmitting-tutor is similar to a music teacher, insisting that you do it right, and scolding you for "playing those quarter notes too short," or "rushing the whole notes."

The bare-bones circuit of this device first appeared in the Tab Book entitled *New IC FET Principles and Projects*, by Sessions and Tuite, copyright 1972, as project 14, "Integrated-circuit Keyer," on pg. 124. In the early '90s, I did a revamp and used different ICs because it made it possible to obtain all the parts at Radio Shack. The revamp was published in *Radio Fun* magazine in the early nineties. Only two of the four sections of the 4011 were used for the clock oscillator. It seemed a waste not to use the two other sections for a sidetone oscillator. Well, once we have a dedicated sidetone oscillator, why not devise a way to use a straight key? The sidetone could then be used as an old-fashioned code practice oscillator. While using the unit, it became obvious that the straight key option could also be used as a transmitter tune function. Why stop with a straight key option — why not have the sidetone incorporated as part of an RF monitor as well?

One day, while reading the mail on two meters, I heard the lament that "it would be nice to have a Vibroplex bug, but it takes practice in order to learn how to use those things." Well with the tune provision, and an electronic (double) key such as a Nye or Bencher or similar, this CPO can function as an electronic bug. You have (electronics-generated) automatic dots on one side, and manual dashes on the other side. You can slow the speed to a comfortable rate, set the switch to the TUNE/SEMI AUTO position, and use this

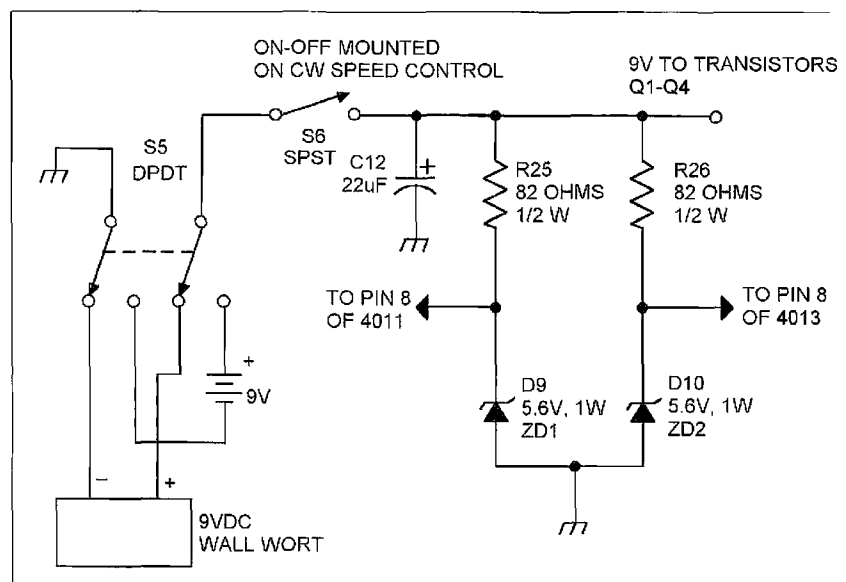


Fig. 2. Power supply connections.

CPO as a practice Vibroplex bug. Making the transition, then, to "the real thing," will be a lot easier.

Not only that, but the reverse is possible. The sidetone can be accessed, so that you can plug in the Vibroplex bug and you can practice, making for an easier electronic-to-the-real-thing bug transition. If you are completely new to amateur radio, plug in a straight, and the device can be used the same as an old-fashioned code oscillator. Included on the RF monitor side is an LED indicator. If you have a hearing defect — "are tone deaf" is how some describe it — the LED allows for visual CW. Other than egg in your beer, I can't think of anything else you can ask for.

How it works

Reference the schematic, block diagram, and signal flow diagram. The heart of the CPO is the clock oscillator portion of IC 4011. Its speed is adjusted by R12 in series with R13, and C8. R14 and R15 are also part of the circuit that makes up the user speed control adjustment. R15 is the front panel user control; R14 is an internal 20-turn trimmer speed limit-set pot. Refer to Fig. 1. 1/2 of the 4011 generates a signal which is fed to pin 3, 1/2 of the 4013 dual flip-flop (FF-A); the clock signal is divided by two by the first half of the 4013. The output, pin 1, of FF-A, is fed to the diode OR gate, the 1N914's. (See signal flow diagram also.)

The signal is impressed on point A (of the schematic as well as signal flow diagram), the base of Q6, which turns Q6 on and off. Q6 is the relay driver transistor (a 2N2222). Closing the dot key results in shorting pin 4 of FF-A to ground, resulting in the transmission of a dot. However, here's where things get more involved, with the operation of the second FF, and what contribution it makes.

The signal from the first half of the 4013 FF-A serves as a clock for the second half of the 4013. When the key is pressed on the dash side, pin 4 is shorted to ground and pin 10 of the 4013 is grounded through the diode D6. Closing either dot or dash key removes

the pull-up voltage provided by R16 as well as R19 (in the schematic). The pull-up voltage is necessary to ensure that the 4013 is held OFF at pin 1 when the key is opened.

Also, in generating a dash, the output of the first half of the 4013 is pins 2, 5. The output at pins 2, 5 is the same divided-by-two clock signal that is output at pin 1, only it's inverted. The pins 2, 5 signal serves as a "clock" for the second half of the 4013 FF-B. Again, this "clock" signal is divided by two by the second F-F B (as in timing diag. C).

The output of the second 4013 FF-B is fed to the diode OR gate; however, unlike the generated "DOT" as described above, that's only two thirds

of the DASH signal and there is no automatic output. There is no output, because a DASH can only be generated if both FF-A and FF-B are "turned on." FF-B is turned on by closing the dash key, shorting pin 4 of the 4013 to ground, which removes the pull-up voltage from pin 10 of FF-B. Both FF-A and FF-B are turned on by closing both keys at the same time, or through the inclusion of diode D6 in the schematic, and closing the DASH side of the key. Diode D6 can be switched in and out of the circuit by S2. This enables squeeze or alternate keying to be used.

In either case, the outputs of FF-A and FF-B are combined in the diode OR gate and produce a glorious

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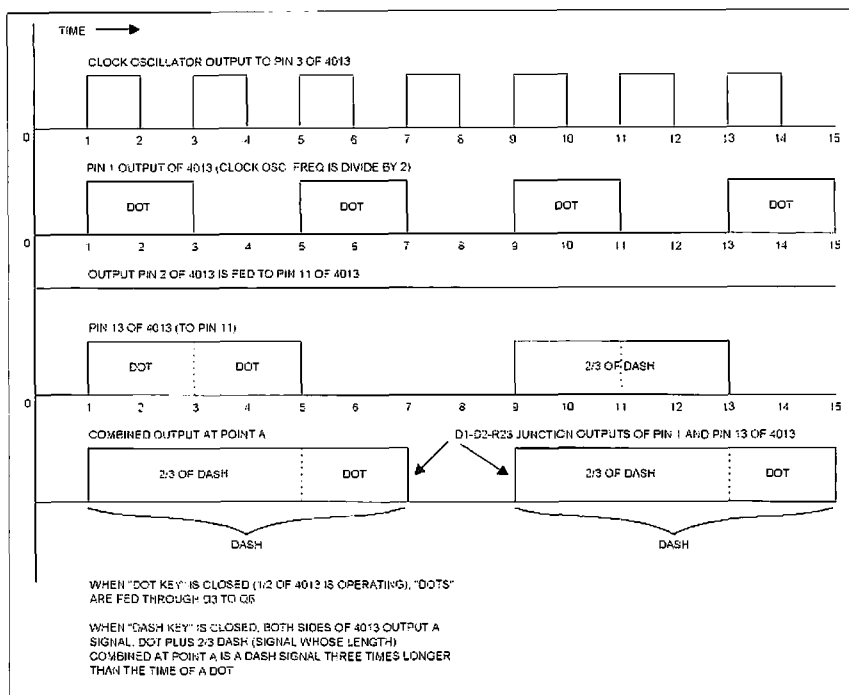


Fig. 3. Timing diagram.

TRANSMITTED perfect dash! The upper part of Fig. 1 shows a selectable (through S4) RF detector. It allows for using the sidetone oscillator while transmitting, or monitoring the signal transmitted by the transmitter, as part of the CPO (as you can see, this bad boy is more than just another "code oscillator"! because it can provide an alternate means of monitoring a transmitted signal, other than the included sidetone generator.

The sidetone oscillator is made up of the other two of the four sections of the 4011. The clock and sidetone oscillator have exactly the same circuit configuration, except that the resistor and capacitor values are different. The sidetone pitch is adjustable; the nominal frequency is 750 Hz. The output of the side-tone oscillator is fed to the output transistor (speaker driver), direct-coupled. The sidetone output transistor is configured to "amplify" the square wave output of the sidetone oscillator. The transistor functions as a pulse amplifier — this configuration was chosen because it would operate well, with a minimum number of parts, at higher efficiency than a regular audio amplifier.

That's also the reason a transformer is used in the speaker drive circuit. The

output transistor was required because of the lack of output level of the 4011. The on-off switch is mounted on the volume control. The keying relay K has a bypass (key click) capacitor across it. Relay K is an SPST reed relay; this particular unit is available at Radio Shack. Another reed relay could be used; however, the relay winding must be able to handle the collector current of Q6.

C10 and D5 make up a relay driver decoupling circuit. Q5 allows for direct keying during semi-automatic operation. When the key is closed, the forward bias is removed from Q5; the output goes high and the signal is fed through steering diode D7 through switch to the base of Q6 through current limiting resistor 23. D8 and C11 form a power supply decoupling circuit.

The power supply

The project started out using a single 9V battery. However, adding the sidetone oscillator made it absolutely necessary to design into the unit decoupling provisions for the V+ pins of the ICs. Without the parts used in the de-coupling network, specifically the zener diodes, really bad feedback occurs through the power supply. (See power supply.)

Without the zener diode circuit, the device operates like anything but a keyer. I initially tried the old standby, a resistor/capacitor de-coupling network, which proved to be woefully inadequate. One watt 5.1 volt 1 watt zeners are used; 1/2 watt zener diodes proved to be too small — they could not handle the current swing — but the larger-wattage zeners draw much more current. The circuit and components shown in Fig. 2 worked and were incorporated.

The device, overall, draws more current than I would like. Unfortunately, a single 9V battery will not last too long (three or four 9 volt batteries could be connected in parallel for longer operating time). AA or larger-size cells, six of them wired in series, are a good choice. Six C cells in series would be a good choice, too. They have a good energy-density to size ratio; however, they are large compared to AAs, but they do last considerably longer than AA cells. An AC battery switch is provided for batteries or a 9-volt "wall wart" power pack operation. A good, filtered, DC wall wart (about 800 mA) should do it.

How do we use this thing?

To start, set the switches for full automatic, and internal sidetone. Use any full automatic key. For that matter, you can probably make some sort of key lash-up using microswitches, if you have no key — or even two brass strips wired to act as dot dash keys will get you started. Set the right-/left-hand switch to send either dots or dashes when the "finger presses" that side of the key. In other words, you want to use the full automatic key as a single straight key one half at a time to have immediate access to either dot or dash control. Set the unit so that the fingers side is used in sending dots. The thumb controls dash transmission. A straight key alone can be used; however, a stereo plug must be incorporated and wired appropriately, and then you have to switch the right-left switch back and forth for the appropriate dot or dash side.

Here is the meat and potatoes of this CW smorgasbord.



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1. Start at a slow speed and do dots only — a few mistakes are acceptable — and *practice!* Stick with sending dots until you feel as though you could stay with the machine forever. How long this takes depends on the individual; everybody is different.

2. Then slow down the speed a little, and stay with the machine, etc.

3. Next, slow down a bit more. The reason to slow is to burn in a TIME INTERVAL FEELING! Remember, we are looking at dissected CW under a microscope.

4. Finally, the day arrives when you are ready to pick up speed. Increase your speed to something comfortable, where you just, just, start making mistakes; then practice some more.

5. Return to the slower speeds and practice slow-speed CW to retain what you established in the first four steps.

When you have that down, practice the dash next, the same way, and following steps 1 through 5. Warm up each day by starting at the slower speeds. When you have mastered the above for I and T, you have established a CW foundation. Next combine dot dash, or dash dot, it doesn't matter which, and practice A or N at a comfortable speed and, of course, follow steps 1 through 5, and that's the basic routine. Follow with the letters M, I, S, O, etc.

Keep in mind, and it's important enough to warrant repeating, that we're working to develop a timing sense. I guess it could be called CW rhythm. As stated before, it takes practice, perseverance, and patience.

The patience, for most, is to have patience with yourself. Boredom is for children. Talk about boring, if I had a nickel for every time I practiced a major scale, I'd be as rich as Bill Gates; well, maybe not quite. Once you have

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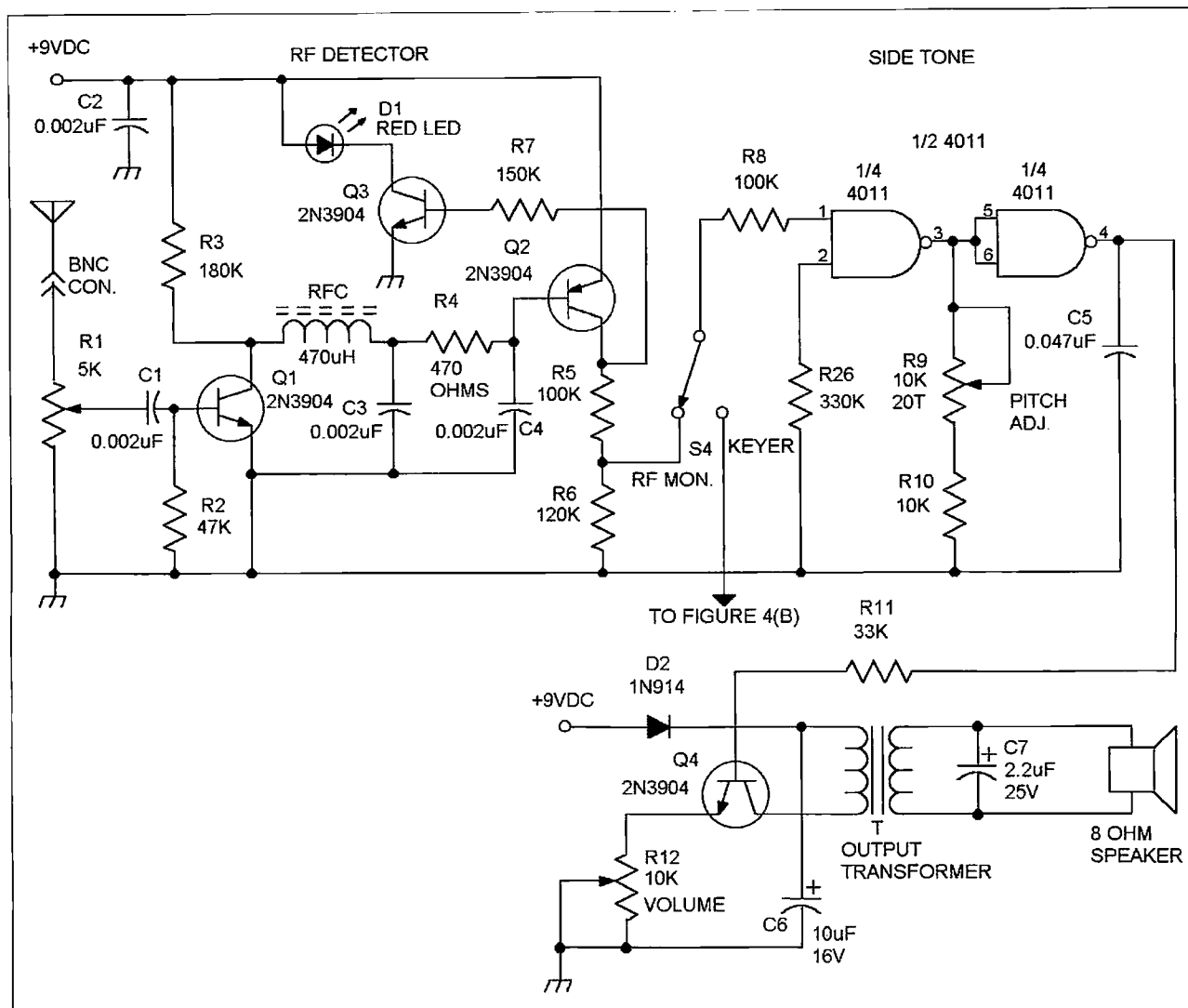


Fig. 4(a). Main schematic.

played a major scale there is nothing more to learn, intellectually; however, practicing scales on any musical instrument is vital if you want to play well. Boring? Go to agony and turn left! As you persevere and see the positive effect on your performance, it gets easier overall. The motor skill learning period gets shorter, and your CW sending gets better, and the speed takes care of itself.

As for the "CW is useless" crowd, I don't care how many new high tech communications gadgets come on the scene, CW is like oars (oars have been around even longer than CW, I'll bet) that you take along in a "row boat" that has an outboard motor hung on its stern. Those oars (you do take them along, don't you?) just might come in handy if the motor conks out.

But, but, oars are so slow, so low tech. CW, like the oars, may come in handy at some point in time, too, even though you have the latest microprocessor-controlled boat motor.

The ops who like CW find CW handy anytime. I have for years been using the essence of the above outlined method, in order to learn to play what at the time were rather difficult passages in a musical composition. The method works for music. Sending CW is nowhere near as involved as playing music!! Be patient with yourself. Practice the above method on a regular basis. And persevere, "stay with it." Who knows, in time you might even get the urge to learn to play the bass fiddle — well, it worked the other way around for me!

Musicians have "the edge" in learning CW. There's nothing special that musicians have that makes it easy for them to learn CW — they just know how to practice! Playing music is a motor skill. "Playing" CW is a "motor skill," too, but much less involved, and orders of magnitude simpler than playing music.

Construction of this project is straightforward, for the most part. I used perfboard because I had the right-size piece on hand. I like using sockets for transistors as well as ICs on perfboard, or on a PC board. Component layout is in general, not critical. The only thing that I found to be critical is the RF monitor circuit layout. Originally I constructed the monitor on the main circuit board; that necessitated

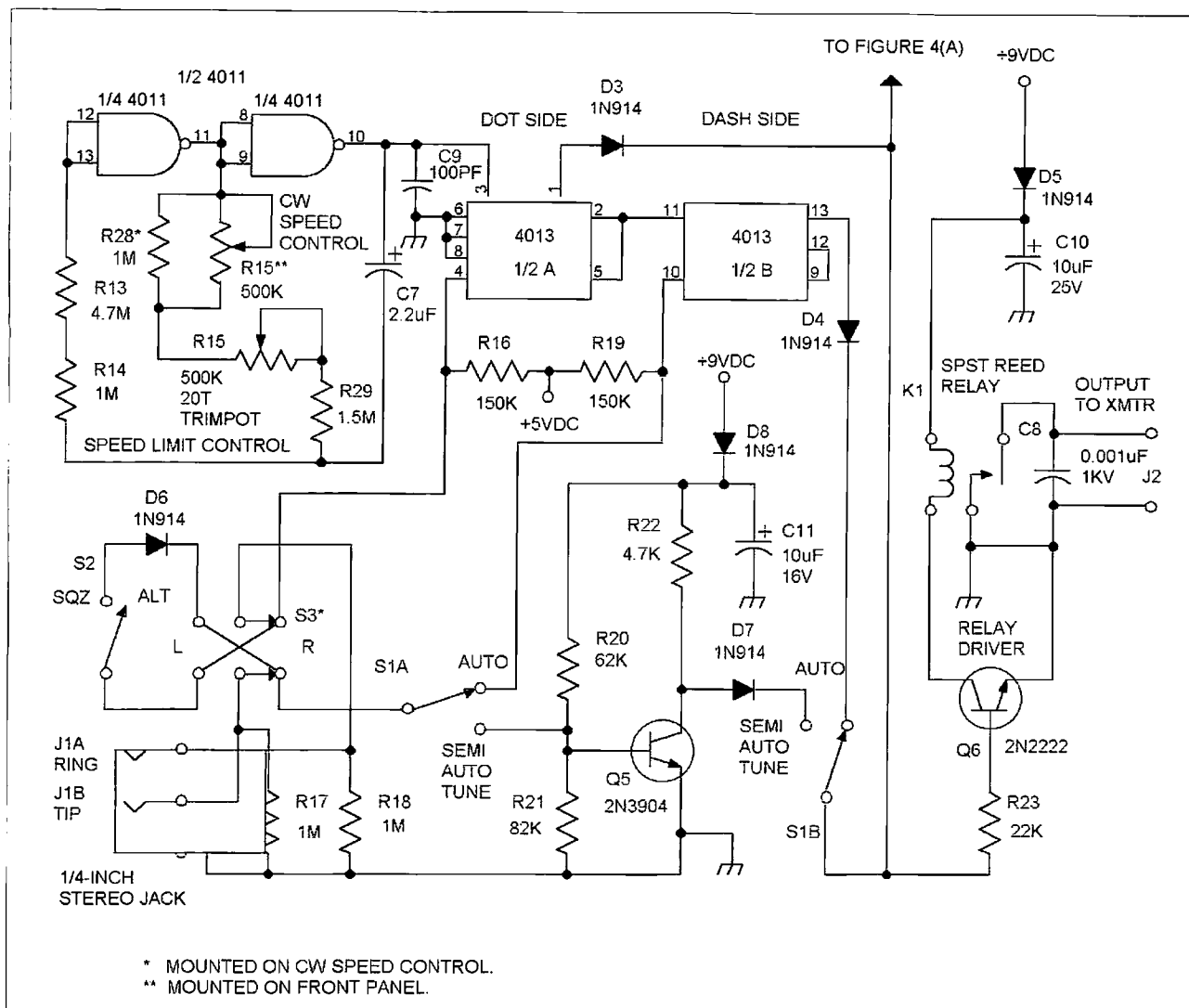


Fig. 4(b). Main schematic.

the component parts pieces to be too close. I found that there was stray electromagnetic coupling between transistors that rendered the detector circuit useless. However, the RF monitor circuit could be made close-spaced if proper shielding were used; also, that would make for a compact project. It's possible to build the RF monitor and sidetone circuit only, to be used as a standalone transmitter monitor. I found that the RF circuit transistors have to be separated at least one inch; otherwise, there is really bad, stray coupling. There is a serious interaction between transistors.

How the RF section works: An RF signal is fed from the pickup antenna through the RF sensitivity control, through CI, and is developed across

R2. Q1 behaves as an RF detector, and its output is filtered through the inductor L along with C3, R4, and C4. The filter section components are what facilitate broadband operation, i.e., 1 MHz to about 50 MHz. Q2 is a level shift amplifier and supplies a DC signal to gate the 4011 sidetone oscillator portion through the resistor R8. The DC output from Q2 is fed directly to Q3 through current limiting resistor R7. R5 and R6 form a voltage divider, which reduces the DC gate voltage to a safe value for the sidetone gate input I.

I used a Radio Shack project box to house this beastie, which measures 5-3/4 by 5-1/4 by 2-3/4. Any other metal project box could be used; I don't think I'd use an ABS plastic box,

however. The layout for the most part is not critical, but it's best to keep the leads to the front panel controls as short and direct as possible.

The speaker, which I mounted on the front panel, could have been mounted on the side. Ventilation slots are cut into the cover, and it would not be necessary to cut a big hole in the front panel (isn't hindsight wonderful?). Not only that, it would also give more room to spread out the user controls. The back panel has the monitor pickup antenna connector (a BNC was used because it was lying on the workbench at the time) mounted on it, as well as the RF sensitivity control. Coaxial cable, in this instance, was not needed because of the short leads involved. There's no reason why the RF sensitivity

CW Practice Lesson

Reasons Why the English Language is Hard to Learn (Author unknown)

- 1) The bandage was wound around the wound.
- 2) The farm was used to produce produce.
- 3) The dump was so full that it had to refuse more refuse.
- 4) We must polish the Polish furniture.
- 5) He could lead if he would get the lead out.
- 6) The soldier decided to desert his dessert in the desert.
- 7) Since there is no time like the present, he thought it was time to present the present.
- 8) A bass was painted on the head of the bass drum.
- 9) When shot at, the dove dove into the bushes.
- 10) I did not object to the object.
- 11) The insurance was invalid for the invalid.
- 12) There was a row among the oarsmen about how to row.
- 13) They were too close to the door to close it.
- 14) The buck does funny things when the does are present.
- 15) A seamstress and a sewer fell down into a sewer line.
- 16) To help with planting, the farmer taught his sow to sow.
- 17) The wind was too strong to wind the sail.
- 18) After a number of injections my jaw got number.
- 19) Upon seeing the tear in the painting I shed a tear.
- 20) I had to subject the subject to a series of tests.
- 21) How can I intimate this to my most intimate friend?

control couldn't be mounted on the front panel. Of course, if it was, coax cable wiring is advised. If AA batteries are used for the power source, a deeper enclosure would be a good idea because then a battery holder for six AA

batteries could be mounted on the back panel.

Also included in this article is a code practice lesson to help make CW a little bit easier to take. You know that spoonful of sugar theory!!

A word about the graphics. The timing diagram shows the output of the clock oscillator and how it is divided by the first F-F, the output of which generates a dot straight away. How the inverter output of the first F-F behaves as a "clock" signal for the second flip-flop. The second F-F divides by two, and its signal is combined with the first F-F, the combination of which forms a dash. The signal flow shows this from another prospective. The function block illustrates how each major system interconnects, and the function of each.

In conclusion, all in all, this is an easy project that can be used by seasoned and beginning amateur radio operators alike. Unlike code oscillators of the past, this one keeps on going, and going and going! If there is enough interest, I could be persuaded to put together a kit of parts sans enclosure and pots. If there is a really strong demand, a wired circuit board could be made available. I sincerely hope you find that this project helps your overall CW skill in the manner intended. Here's to a good fist, and improved CW operating among the amateur ranks. I hope this generates enough curiosity among the CW-oughta-be-a-band crowd that we get a few converts. 73 and God bless. K8MKB.

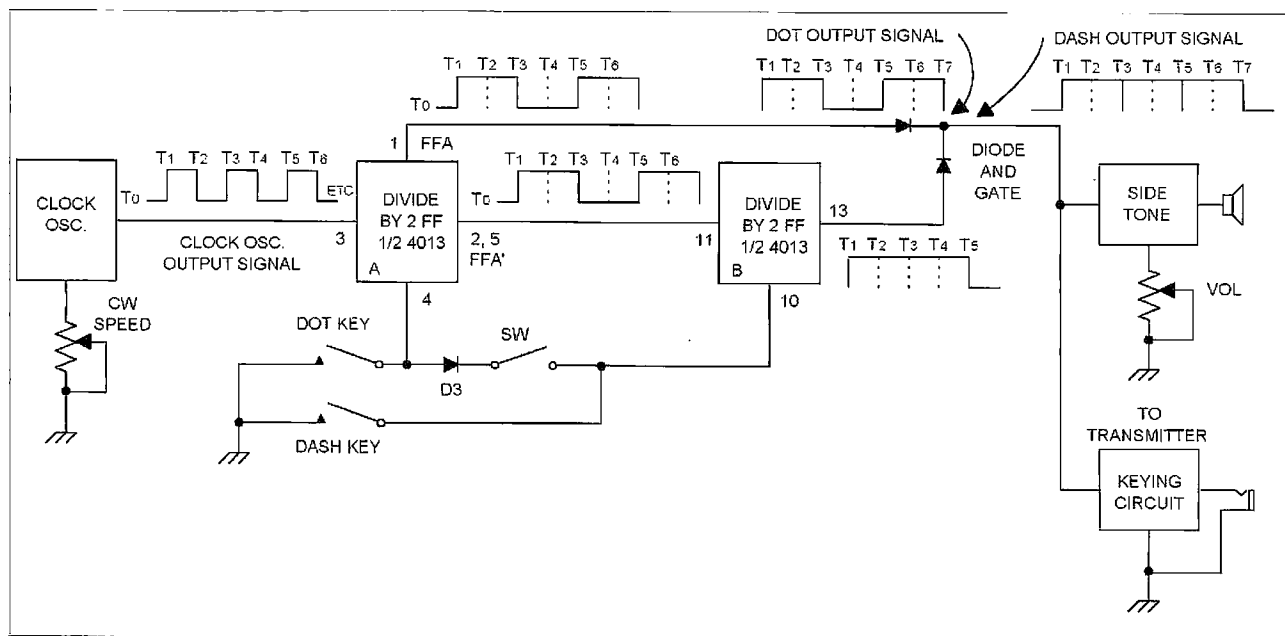


Fig. 5. Signal flow diagram.

Part	Description	Part	Description
R1	5k 1/2W pot	C1-C4	0.002 μ F
R2	47k	C5	0.047 μ F
R3	180k	C6, C10, C11	10 μ F electro
R4	470 Ω	C7	2.2 μ F axial electro
R5, R8	100k	C8	0.001 μ F 1 kV ceramic disc
R6	120k	C9	100 pF 50 V ceramic disc
R7, R16, R19	150k	C12	22 μ F radial electro
R9	10k 20T trimmer, top adjust	D1	Red LED
R10	10k	D2-D8	1N914
R11	33k	D9, D10	5.6 V 1/2W zener
R12	10k 1/2W audio taper pot, with SPST	Q1, Q3, Q4, Q5	2N3904
R13	4.7M	Q2	2N3905
R14, R17, R18, R28	1M	Q6	2N2222
R15	500k 1/2W linear taper panel ml. pot	IC1	4011 (osc. timing/clock) quad two-input NAND gate
R20	62k 2%	IC2	4013 F.F.
R21	82k	J1	1/4-inch stereo type
R22	4.7k	J2	1/4-inch single circuit type
R23	22k	S1, S3, S5	DPDT miniature
R24, R25	82 Ω 1/2W wirewound	S2	SPST miniature
R26	330k	S4	SPDT miniature
R27	500k 20T trimmer, top adjust	S6	On-off pan of vol. control
R29	1.5M	Other	Screws, nuts, lockwashers, knobs, standoffs, penlight battery holder (for six batteries), enclosure, etc.

Notes: All resistors 1/4W unless otherwise specified. All capacitors 16 V unless otherwise specified. Output transformer and speakers available at Radio Shack.

Table 1. Parts list.

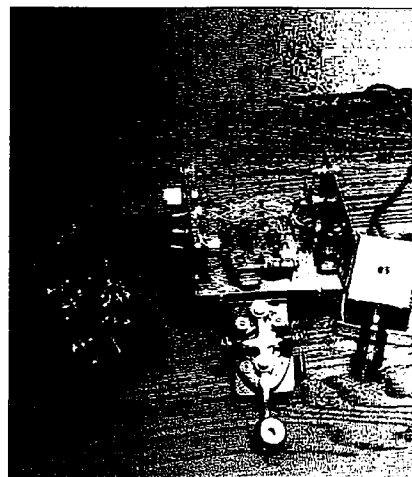


Photo A. A right fancy CPO.

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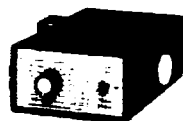
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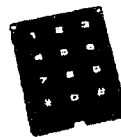
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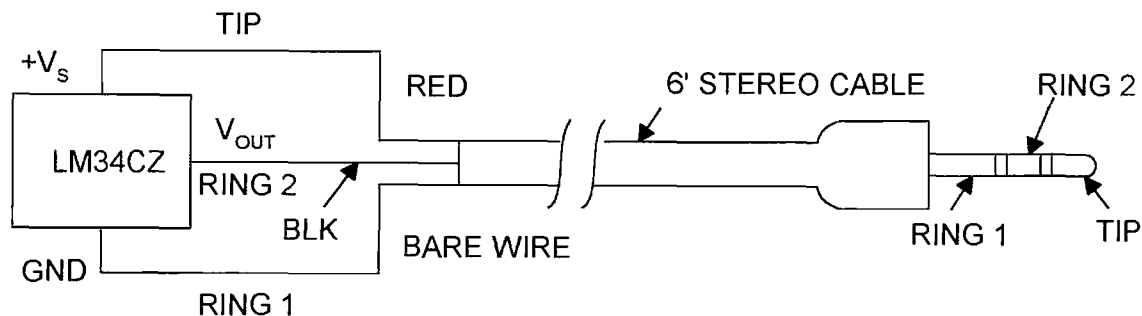
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(a) CONNECTIONS TO PROBE WIRE

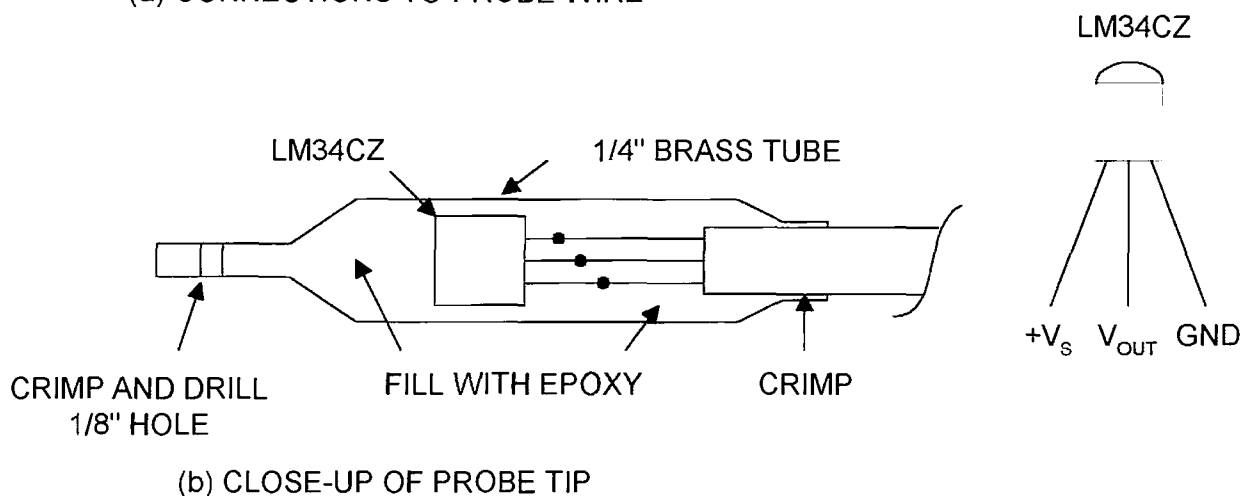


Fig. 2. Temperature probe assembly.

Strip the sleeve back about 1 inch. Attach the wires to the LM34CZ tem-

perature sensor as illustrated in Fig. 2a. Stagger the solder connections as

shown in Fig. 2b. Use a small piece of electrical tape to insulate the center wire of the sensor from the other two wires and use another piece of tape to wrap around all three leads. Next, cut a 1-3/4-inch-long piece of 1/4-inch-diameter brass (or copper) tubing. The tubing can be obtained at most hobby stores. Fill the tube with epoxy and insert the temperature sensor. Crimp the brass tube around the cable and crimp the other end flat.

After the epoxy

has set, drill a 1/8-inch hole in the flat end of the probe assembly. This hole makes it easier to attach the temperature probe to the surface where the temperature is to be measured.

Drill holes in the case for J1, J2, J3, and S1 (see Fig. 3). J2 and J3 are red and black tip jacks. The jacks specified in the component list (Table 1) are the correct size for the tip plugs on most multimeter test leads. Banana jacks may be used instead of tip jacks. To use the banana jacks, larger mounting holes will be needed. If you make this substitution, be sure that there is still room to mount the power switch S1.

Utilizing banana jacks will require two test leads with banana plugs at each end to connect the multimeter to the Digital Multimeter Temperature Measurement Adapter. Mount J2, J3, and S1 to the case. Refer to the back of the phone jacks packaging for J1's terminal designations. Assemble the

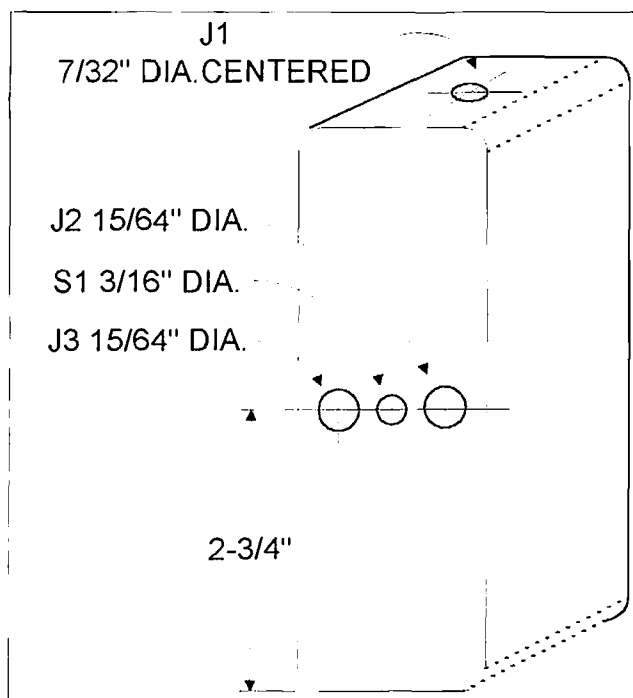


Fig. 3. Case hole locations.

Continued on page 22

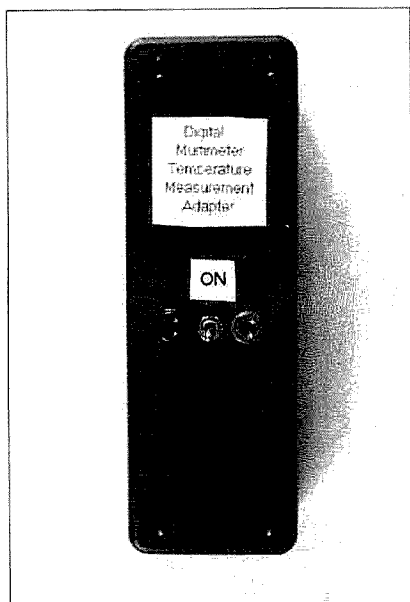


Photo A. Exterior view.

Ham's Handy Heat Hunter

continued from page 21

circuit shown in **Fig. 1** using point-to-point soldering.

Finally, mount J1 to the case. To keep the battery from rattling around in the case, place a piece of foam between the battery and the case. Next, attach the lid to the case with the screws provided.

Use

Plug the temperature probe into J1

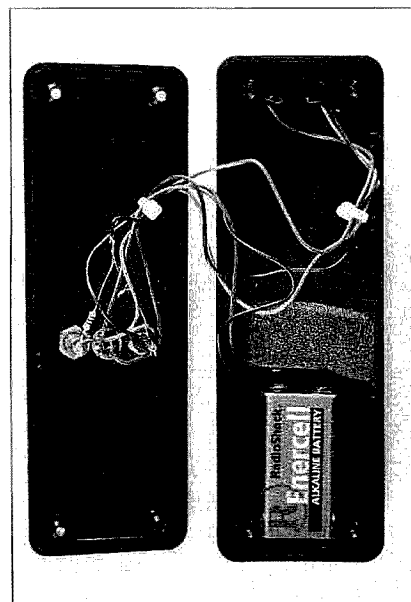


Photo B. Inside view.

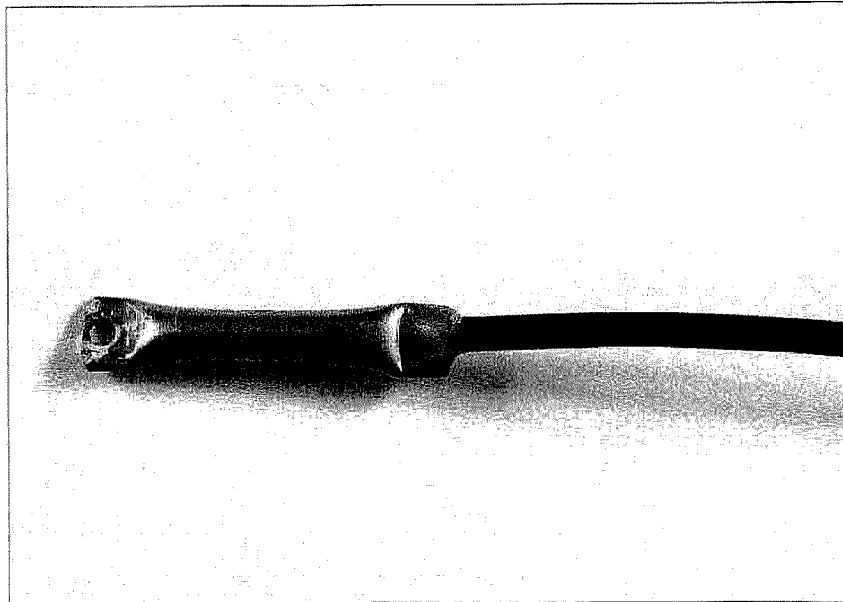


Photo C. Probe tip.

with the multimeter's red lead plugged into J2 and the black lead plugged into J3. Turn on S1. The voltage reading of the multimeter will be at 10 mV per degree F as mentioned earlier.

If it is necessary to measure temperature constantly, a digital panel meter can be used in place of a digital multimeter. Don't expose the temperature probe to conditions that are harmful to the brass tube or cable insulation.

In order to determine if the environment is harmful to the temperature probe assembly, save the one-inch

piece of cable insulation obtained when assembling the temperature probe. Expose this piece of plastic to determine if the environment is damaging to the cable. Likewise, a piece of the remaining brass tubing can be used to determine if the environment is corrosive to the brass. If it is determined that the temperature probe assembly can be damaged by the environment, it may be necessary to use a cable rated for these conditions.

Continued on page 56

Part	Description	Jameco P/N	Mouser P/N	Radio Shack P/N
R1	22k 5% 1/4W			
U1	LM34CZ	107094		
D1, D2	1N1418			
S1	SPST switch			275-624
J1	Stereo phone jack			274-249
J2	Red tip jack		530-105-0802-1	
J3	Black tip jack		530-105-0803-1	
Case	6x2x1			270-1804
Stereo cable	6 ft.			42-2387A
9 V battery clip			123-6006	
9 V battery				
Brass tube	1/4-inch diam. brass tube			
Hookup wire				
Epoxy				

Table 1. Component reference.

Ozzie's Jupi-Loop

Use an aircore balun with your Ten-Tec Jupiter.

Back in December of 2001, I purchased a Ten-Tec Jupiter Model 538 transceiver. I live in a senior citizen retirement condo that has 275 apartments. You can imagine how many electronic devices they have — everything from fire detectors in every room in every apartment to an electronic gate and security system. Not to mention all the TVs and stereos and a good number of people wearing pacemakers.

I had to be careful about how much power I could run and also what type of antenna to use. One thing about hams: "If there is a way to do it, we will find it." I live on the third floor of the condo (method to my madness!), so I had access to the attic. You have to also remember that there is no ground to attach the transceiver to — even all the water pipes are plastic. This presented a problem as far as interference was concerned.

The attic was partitioned off and I didn't have as much room as I hoped for. I first erected a 20-meter dipole, and although it worked fairly well, I could not operate 40 meters or the other high bands. I also had a problem with TVI on channel 2, despite the fact that we were on the cable system. The RFI was also getting into one of our telephones.

Although I liked the radio, it had no internal antenna tuner. Consequently, I had to use an outboard tuner to get a reasonable SWR. In the meantime, I received an E-mail memo from Ten-Tec saying that a built-in antenna tuner was available either in kit form or assembled for installation in the Jupiter. I opted for the kit because I love to do my own thing.

Now with the tuner installed and working, I wanted more than one-band operation. I put my thought processes to

work and decided to use a horizontal

Continued on page 56

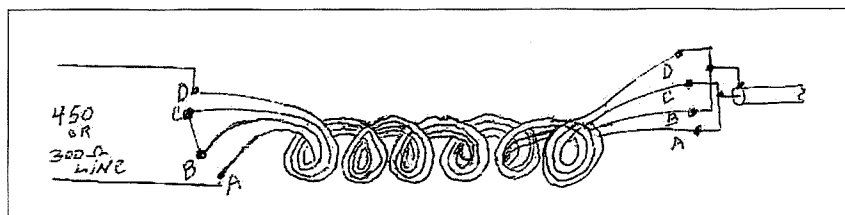


Fig. 1. Balun: four 10-ft. lengths of #14 coated wire; 1-inch-diameter PVC 16 inches long.

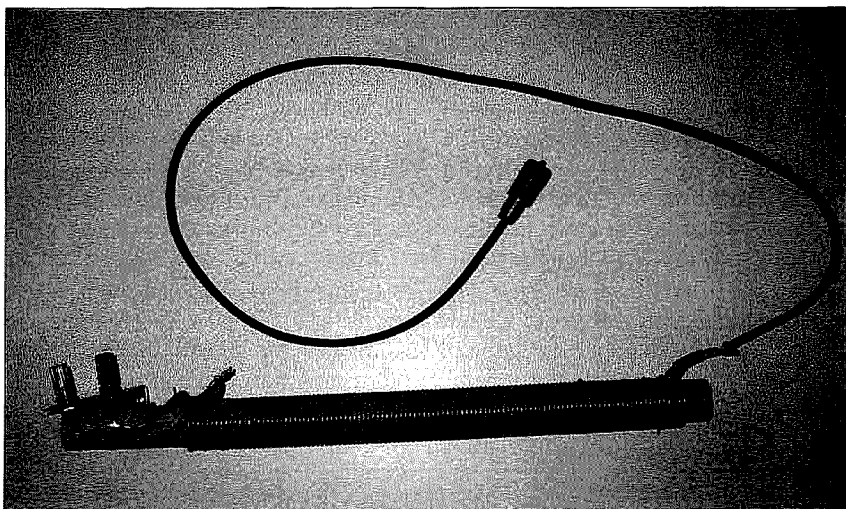


Photo A. The Jupi-Loop.

Ishmod Update

I have spent far too many years running down leads on the enigmatic Ishmod Kaduk. And it's gotten me nothing but trouble. Yet, here I am still chasing him. What a story he could tell us if we could only find him before he fails to return from one of his many potentially fatal journeys.

If you recall, way back in 1984, the original report of Ishmod's ill-fated DXpedition to an uncharted island — or better, rock in the Bay of Bengal — was chronicled in the April issue of 73. It seems that Ishmod's small group had abruptly disappeared under what at best could be said were mysterious circumstances. Or, at least that's what was gleaned from what later would be called Ishmod's Journal, a weathered diary found years later by an American tourist traveling in the East.

What happened with Ishmod was and maybe never will be clear. But it got under my skin, and has led me to spend a completely unreasonable amount of time trying to get to the bottom of it.

The whole affair has made me sort of crazy, because every time I get close to one answer, another three questions appear. I thought I'd placed the whole thing behind me about ten years ago when suddenly in 1999 I read a short news item in 73 about a connection to the elusive Ishmod possibly being sighted somewhere near Indonesia.

The 1999 report mentioned that an unknown member of Ishmod's original DXpedition had been asking about transportation to Easter Island from

the small village of Raba on the Indonesian island of Sumbawa, about 600 miles east of Jakarta. You might ask, as I did, why this request would catch anyone's attention. Well, the request for travel had to be on a wooden-hulled vessel with copper cladding. Nothing else would do.

From what I have been able to determine, in an odd sequence of events, the owner of a small grocery store — what we in the West would call a convenience store — one Tsrif Lirpa, in Raba, was also an amateur operator and had been leafing through some old copies of 73 before bundling them up to sell to a paper recycler who called at the island every three months or whenever he needed money. Lirpa's task in the back of his shop was interrupted by the tinkling of the small bell attached to the shop's front door.

When he went out front to greet his customer, he saw a small man whose intense dark eyes were scanning the store, and then fixed on a photo of an old fishing boat tacked to the wall behind the counter. The visitor told Lirpa that he'd been directed by a man mending nets on the pier that the shopkeeper might know where he could rent a boat for a couple of weeks. The

visitor insisted that the vessel had to be constructed of wood, have copper sheeting below the waterline, and a metal, preferably steel, mast.

The faded black and white photo on the wall showed a boat about 15 meters long propped up on wooden timbers in what looked like a primitive dry dock. It was hard to tell what the mast was made of. The photo looked like it must have been taken nearby, because the outline of the mountain peak behind the boat was obviously the same one that gave this stretch of coast its name: Trident. Though the photo was old, it was obvious that there was some kind of metal sheathing on the hull.

When Lirpa was unable to provide the visitor with any information about the boat in the photo because the latter had been hanging there when he'd bought the store years ago, the visitor asked about whether any other boats might be available in the area. The shopkeeper told him to try asking a person known by only the single name Mena, an old fisherman who lived about a mile down the beach in a weathered cottage. The visitor thanked Lirpa and, before leaving the store, asked to purchase the photo. Lirpa was

happy to make the sale and then went back to his magazine bundling task. That's when things got interesting.

Under subsequent questioning from Raba's lone policeman, Lirpa recalled that his customer carried an old leatherbound notebook because the sequence of letters on the cover reminded him of a call sign, though he didn't recognize it at the time. He also remembered seeing a coil or two of copper wire and what looked like a glass insulator protruding from a tear in the stranger's old backpack.

Lirpa had been quickly flipping through the back issues as he stacked them because he was looking for an old article on a certain kind of antenna once used by a local DXpedition. Lirpa's small plot of ground and limited income made him a keen experimenter with small, efficient antennas.

As the pages of the April 1984 issue of 73 blurred past, a photo of three men in a tent caught his eye. One of them looked like a younger version of the man who had just purchased the boat photo. He ran out the front of his store, looked down the sandy street in Mena's direction — and saw nothing but the sea and a pelican hovering in the wind.

That night, after he'd closed down the store, he went home with the issue of 73 tucked under his arm. He read through the article about Ishmod's Journal twice before his simple dinner and once afterward. He felt oddly uneasy about his photo-buying visitor, but eventually fell asleep.

The next morning, before leaving for work, he went on the air and eventually contacted a ham in California who relayed his report about the visitor to the 73 editorial offices. Ishmod's parents, who had all but given up hope on their son's whereabouts, were contacted, and they immediately flew from Chilka to Jakarta and then via a float plane and two small water taxis to meet with Lirpa at his store in Raba. They brought with them some photos of their son, Ishmod, along with a police forensics' photo-reconstruction of what their errant son might look like via a computer-aging program.

To their delight, Lirpa said that the

man visiting his store a week earlier looked very much like the computer image. Mena agreed when Ishmod's parents, Filia and Darjon Kaduk, showed him the police photo, but shrugged when asked where the man (apparently Ishmod) had gone after Mena told him that most of the boats these days were steel. He did tell Ishmod that there were a couple of tiny villages about ten miles east of Raba that used to have at least one fishing boat clad with copper, though this was years ago. Mena thought the boat had been a derelict and some of the locals had towed it in before it grounded on the nearby shoals.

Filia and Darjon rented a boat and a "captain" recommended by Lirpa, thanked him for his help, and said they were going to see what they could find. They returned four days later looking tired and discouraged, said good-bye, and caught the next water taxi leaving Raba. They told Lirpa that they were staying at the only hotel in Ujung Pandang on the island of Celebes.

That much of the story made it back to 73's editors and they contacted me to see if I could add anything from my years of searching. Well, once again my curiosity got the better of me. I took a leave of absence from work, much to the consternation of my boss, and got back on the road again. After several months of travel, and in an exhausted state, here's what I have to report:



Photo A. Ishmod in Raba?

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Ishmod still is out of my grasp, but that's not the half of it.

Here's how this episode began: After studying what correspondence I received from 73 and after several tries via international telephone operators, I contacted the Kaduks at their hotel and arranged to meet them. I took a flight to Singapore and then via an old Army buddy's connections caught a maintenance transport plane that made several stops but eventually landed on a tiny flat spot near Ujung Pandang. There, I managed to hitch a ride to the small hotel where Ishmod's parents were staying to think over what they should do next.

We shared a simple lunch at the hotel's "restaurant" and compared notes. Considering the time that had passed since either of them had seen Ishmod, and their many failed attempts to catch up with him, I was surprised at their resolve. Though their journey had taken them more than 20 miles beyond

Raba (at least that's what the "captain" had insisted as he apologetically increased the boat rental fee), they had only one slim lead after talking with dozens of villagers and fishing boats along the way.

Exhausted, and just before they turned back toward Raba, the Kaduks had talked with a man out diving for octopus. He remembered a stranger asking about boats with metal sides a few days earlier when he was working on his boat on the shore during low tide. He laughed because no one along the desolate coastline could afford a steel boat. But the man showed him a photograph of an old boat and then the diver understood. Paydirt.

He told the stranger that there was a man who lived in a cave about a kilometer inland up a small river who kept an old boat with some kind of metal on the sides. The fisherman gave directions to the stranger and went back to work.

Ishmod's parents went back to their room and I went down to the shore to look for transportation back to Sumbawa. I found a supply boat leaving in two days and arranged to be dropped off in Raba while the supply boat offloaded diesel fuel for the town's generators.

The next morning, when they awoke, the Kaduks noticed that something had been slipped under their rattan door. Upon closer inspection, it turned out to be a photo — recent, by the looks of it — of someone they immediately recognized as their long-lost son — aged, of course, but parents always know. Thing is, the image apparently showed Ishmod in some sort of a decontamination or moon suit outside Lirpa's store back in Raba. On his back can clearly be seen some sort of sprayer bottle or airpak. When I pointed these details out, for some reason the Kaduks became

Continued on page 88

NEVER SAY DIE

continued from page 9

developing game software, and while I was there I said hello to Ed Juge, one of my 73 advertisers. The copy of the magazine I left with Ed got him so excited that the next time I heard from him he had sold his ham store and was heading up Radio Shack's computer division.

My next stop was SWTPC in San Antonio, where I found them ready to announce their own computer kit.

None of 'em had any software yet, but Sphere was close with a BASIC emulator ... which was pathetically slow.

Byte took off like a rocket ... eventually ending up owned by McGraw Hill. That's a story I'll save for another day. I spent over \$100,000 getting the magazine started and never saw a dollar come back.

When McGraw Hill changed the magazine from a fundamental technical magazine to a business-oriented publication, the end was in sight. In its heyday, with around a half million circulation and over 300 pages of ads, I calculate the magazine was grossing over \$100 million a year.

I was not surprised to see it sink out of sight on the newsstands, and finally die. I put the death down to incredibly poor management.

After starting *Byte* I went on to start *Microcomputing*, and then *80-Micro*, the first computer-specific journal (Radio Shack TRS-80). Then *InCider* for the Apple, *Desktop Computing*, the first magazine written for the businessman instead of the computer hobbyist, *RUN* for the Commodore, and a few more. *80-Micro* did very well, running over 600 pages a month, 13 issues a year.

This was when I started hearing from several megapublishers who were interested in buying my five computer titles. Cutting to the chase, I sold out to IDG (*Computerworld*). Under their management my magazines lost their creativity, then their readers ... and blew away.

R's D Agrees!

Didja miss the July 2001 *Reader's Digest* article, "It's Never Too Late?" Subtitle: "You can reverse a lifetime of bad habits."

The article points out that when young we believe we are indestructible. That idea can be countered by standing naked in front of a mirror and seeing what you've done to your body. With the Department of Health reporting that only 1.5% of us are truly healthy, it is time to clean up your act.

It's time to eat right, get fit, lose that extra weight, stop smoking, and reduce

your stress. Hmm, isn't that what Uncle Wayne has been saying?

I'm getting email and snail from hundreds of people who have adopted what I recommend in my *Secret Guide to Health* and who are reporting major losses of weight, and without dieting. When you change to a raw food diet your body will go to its normal weight. You'll also notice that little annoyances like diabetes, arthritis, hypertension, and cancer fade away.

Fit? *R's D* likes my fast walking a half hour a day approach. They didn't mention rehydrating your cells with 8 to 10 glasses of pure water a day, but they should have.

98.5% of Americans now know that their assumption of indestructibility hasn't panned out. The standard American diet is a slow, but sure, killer.

Property Taxes

Since the Constitution of the United States says the government cannot take private property without compensation I should think that if anyone brought a suit against a state with a property tax that this would eventually go to the Supremes. Alas, the Supreme Court has a lousy record recently of upholding the Constitution, so, even

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Travels with Henryk — Part 11

Adoring the Azores.

This Portuguese overseas autonomic territory is located in the middle of the Atlantic Ocean, between Europe and North America. The archipelago consists of nine tiny islands of volcanic origin. The largest of them is Sao Miguel, and this is where I landed one winter Monday.

The climate, even in the middle of winter, is mild due to the warm waters of the Gulf Stream. And the amateur radio climate is very encouraging here. This island alone boasts at least 350 licensed hams. Not all of them are frequently on the air and not all of them use HF bands. VHF bands are popular both on the island and between the islands. Each of the islands has a distinctive prefix; Santa Maria lying south of Sao Miguel is CU1. Terceira, known for its U.S. military base, is northwest from Sao Miguel and is CU3. Other islands

are less active and with relatively low population.

My first contact with Azores prior to this visit was on the Internet. I looked up the [qrz.com] site and searched for hams living in Ponta Delgada, the destination of my last-minute low-budget flight. Filipe CU2BD (**Photo A**) responded to my E-mail query, and in spite of being a very busy person he could meet me and guide me to the local radio club (**Photo B**). A meeting attracted at least 10 members. The president of the local radio club is young Carreiro CU2IE (**Photo C**). The

club, CU2ARA, has a nice clubhouse (opposite the local jail) but no impressive antennas. On the other hand, there are many quite impressive antennas on the island. The largest one I could see was Eduardo CU2AF's 10-element Wilson array (**Photo D**). Eduardo lives very close to Ponta Delgada, in a village called Faja de Baixa, known for gorgeous pineapples. Eduardo grows pineapples but also does ceramics in his spare time. He is often in short-wave contests and it is easy to work him on the bands.

Filipe CU2BD, who acted my initial

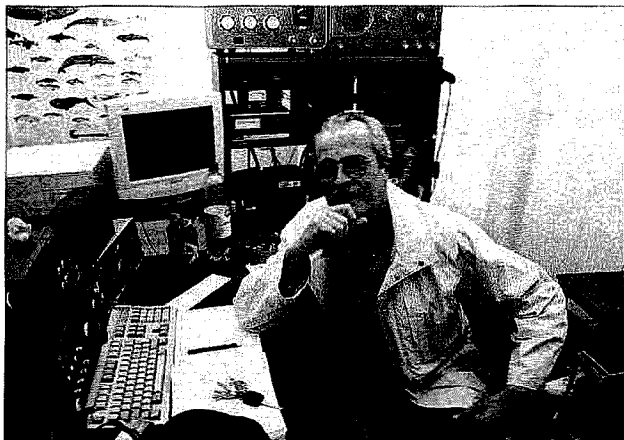


Photo A. Filipe CU2BD at home.



Photo B. A club meeting at CU2ARA, Ponta Delgada, Sao Miguel Island, Azores.

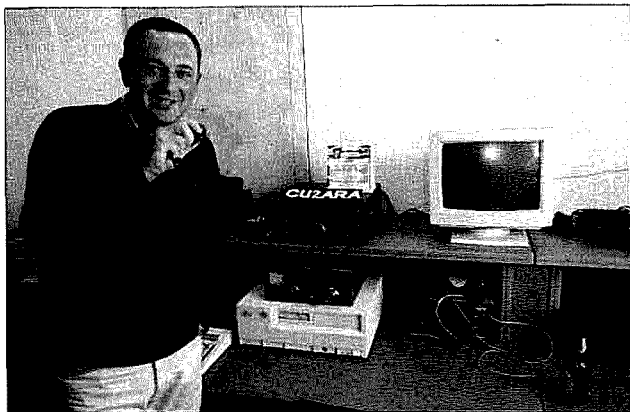


Photo C. Carreiro CU2IE, the president of the local radio club, CU2ARA, at the rig.

guide in Ponta Delgada, also has an impressive antenna (**Photo E**) downtown in the main city of the archipelago, in its old part where one can least expect a structure like this — but he is not active right now, pending his radio to be fixed. It has to be taken to mainland Portugal.



Photo D. Eduardo CU2AF and his 10-element Wilson antenna.

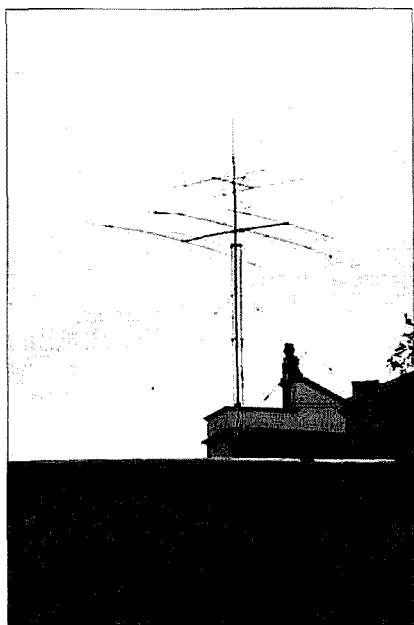


Photo E. Antenna of Filipe CU2BD in the old town of Ponta Delgada.

From mainland Portugal, I received an E-mail message before I left for Azores. It was Francisco CU2DX who works in Portugal. His father is CU2AA and they share a high antenna tower in the village of Livramento. When I passed by, Jacinto CU2AA was not at home, so I only have a picture from the distance (**Photo F**).

Another day I drove to a village called Furnas. There are hot springs, and Tony's Restaurant at the main square. Tony is CU2FX and on the back of his restaurant he has a pipe-supported Cushcraft array. Tony's well-equipped radio station is in the office (**Photo G**), and he has been a ham for about 15 years.

Apart from being on the air myself from the island, I met quite a few local hams. I'd love to visit other islands — each of them is slightly different. It seems that our hobby is thriving here. One of the reasons is the authorities' point of view on amateur radio. After a major earthquake some 20 years ago, the local government finally grasped the benefits of ham radio for the society. Let's hope that authorities in other countries cease fearing amateur radio as being a dangerous and subversive activity.

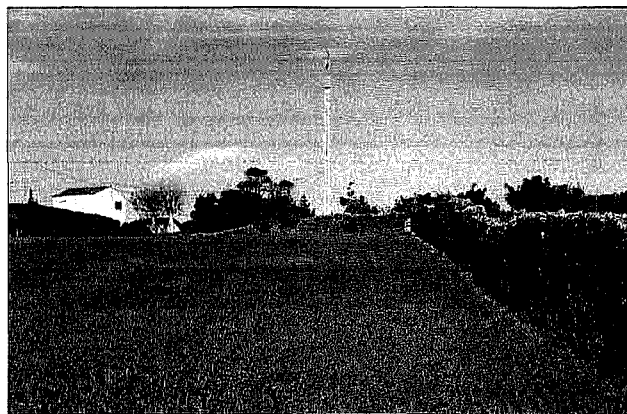


Photo F. Antenna of Jacinto CU2AA and Francisco CU2DX.

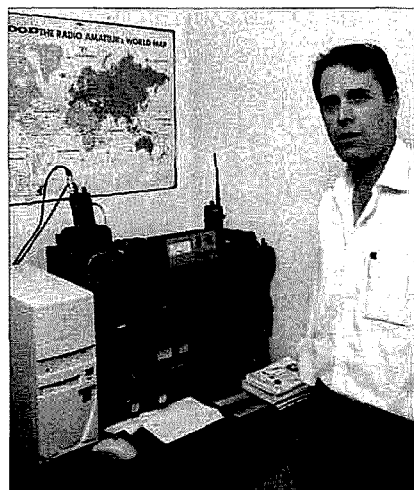


Photo G. Tony CU2FX in the office of his restaurant where he has his radio equipment.

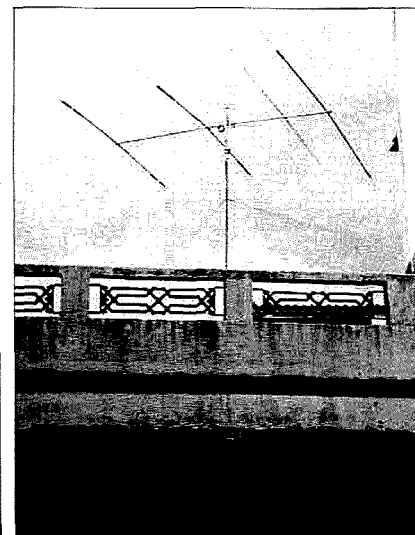


Photo H. Antenna of Tony CU2FX.

The Interrelationship of the Coriolis Force, the Helix Effect, and So-called Einstein Antennas

As usual, 73 takes you right to the cutting edge of ... er ... science?

Water goes down the toilet drain counterclockwise in the Northern Hemisphere, clockwise in the Southern Hemisphere, straight down at the Equator, and not at all if it's clogged. There is no way to change this law of nature, otherwise known as the Coriolis Force. If you force the water to change direction, it will always return to its natural state.

It has now been determined that RF travels down coaxial cable or wire in the same pattern as water down a drain. As for example, UHF antennas are designed as right or left helix, depending on the transmission involved. There are voids or non-RF sections in the spiral, just like a piece of string wrapped around a pencil. These voids of non-RF are wider spaced at low frequencies and closer together at high frequencies.

What can we do with the void or open sections? Send a second or third signal, etc.. that's what. For example, numerous telephone calls are now sent at the same time, utilizing spaces or voids on wire or optic fibers.

What does all this have to do with radio? If you can send more than one RF signal at the same time down a wire (coaxial), then you can also extract or remove all the other signals but one, yours only, or in essence

eliminate all but the most severe noise QRM traveling down the voids. Voilà!

In Albert Einstein's equation, $E=mc^2$, a loss of energy means the total mass of the system decreases. Gravity grows stronger as two masses move closer together. In three dimensions, halving the distance quadruples the attraction. But for a particle existing in nine dimensions, halving the

Continued on page 57

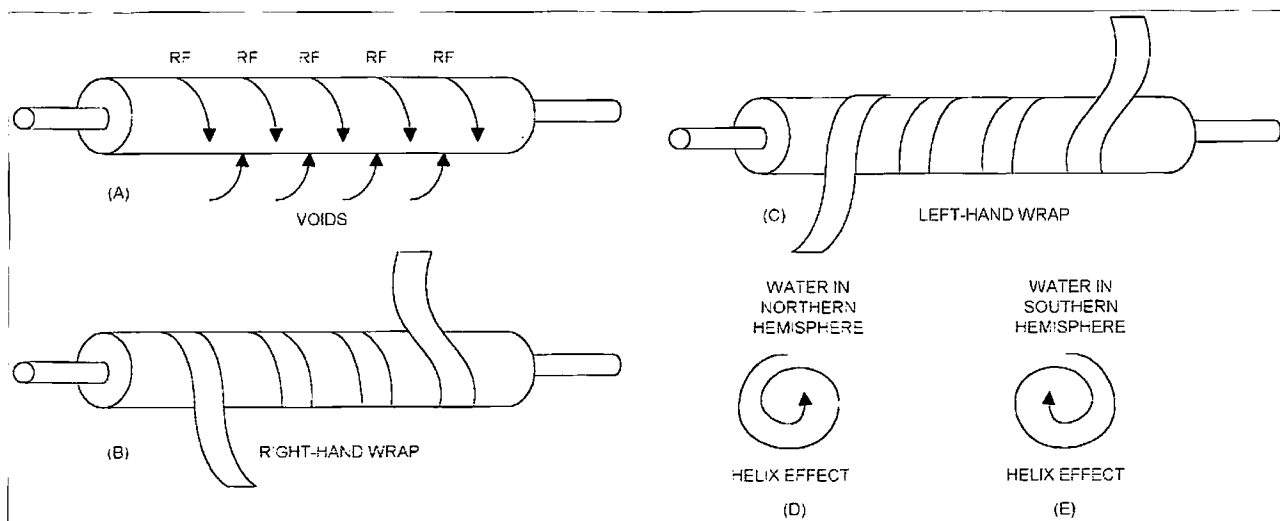


Fig. 1. (A) RF voids. (B) Right-hand wrap. (C) Left-hand wrap. (D) Helix Effect of water in Northern Hemisphere. (E) Helix Effect of water in Southern Hemisphere.

Autobiography of Everyham —

Part 2

How many times do you see yourself in this story?

Shortly after college, my own career at Motorola started; I would go through four cars during the 9-1/2 years that I worked there (all except the first year, in Corporate Research and Development, I was in the communications department).

All cars except the first, a 1974 Mercury Comet, had 220 MHz and 11 meters installed in them: the Comet had 2 and 11 meters. The reason I mention the cars, at least in passing, is that each has associated with it its own unique memories of places traveled to, most for the sake of exploring 220 MHz propagation, and range tests of favorite repeaters; sometimes with, often without, a group of friends tagging along on some trip (if friends were along, range tests typically took a secondary role). It wasn't until the mid-1990s that it seemed that the need for range tests and propagation studies waned; everyone involved had a pretty good idea of what most machines in the area (at least our favorites) were capable of. Coincidentally, about that period of time it seems like all the sites to be seen (at least the tourist-attraction type) had been seen by myself and the group of people I associated with (both casual acquaintances as well as friends): the majority of "regulars" on the band weren't around, and those very few who were didn't seem as enthusiastic as previous to stretch the limits of repeater ranges.

Motorola also helped me to develop, at least obliquely, my home-brewing

career, in that after my first year in the factory, when I moved to a research department I had access to all those goodies a home-brewer needs: reference and data manuals for components, and a few actual cast-off components. By 1988, my tinkering had progressed to the point where the circuit ideas I developed were fit to be published in amateur radio magazines. Not just local club rags, but the magazines that saw worldwide distribution. Back then, particularly on 220 MHz, there were still a few other hams to be found who were involved with home-brewing their own circuits, so sharing ideas (even if these ideas never saw it past the drawing board and were used simply to exercise the brain) helped cement a few friendships. Most notable was probably with Ken N9HDX (then KA9BTJ); we were known to bug out of our houses and hunker down at a local eatery, spreading notes all over the table and diving into discussions. Fortunately, we managed to pick off-peak hours, and order the occasional snack or drink, so as not to get thrown out. (Also, back then "loitering" was not the huge offense it seems to have developed into in more recent times,

so once the waitresses knew we were harmless, we were left alone.)

Some of the circuit ideas we came up with during those brainstorming sessions were unconventional, to put it mildly; sometimes the results of putting those ideas into practice provided their own brand of surprises, as well. One such instance was a 10-meter FM to 220 MHz link I had experimented with. During band openings on 10 meters, my friend Joe would start to work someone on ten from his home (using ten watts and an indoor retuned CB whip), thirty miles away from where I lived with my parents. When the signal on ten would fade out at his place, he'd hear them fade in at my parents' place through the link. He could work stations without missing a beat, no matter how bad the fades. And, when the band was in less than favorable condition, he'd go through my link the other way, and give the people on ten a taste of my 130 watts and outdoor antenna. We were both a bit surprised that such big differences in propagation took place in such a short distance (this was a bit before the time, I think, that things like "diversity reception" became the big buzzwords,

and even then, diversity reception was something used primarily at higher frequencies and in commercial applications).

Creative operation wasn't necessarily limited to those operations involving home-brewed experimental circuitry. One example of such practice was a vacation my dad and I took in California. I had heard about the ham club operating from the *Queen Mary*, and while taking the tour of the boat, we broke off to be guest operators at the radio station. This was in the late summer of 1985; I had not yet gained too much experience with either club station operation, or special event stations (in spite of having been an active amateur radio operator for eleven years at that point), and I was not about to miss an opportunity at such a fine station. I managed to work one station in the Black Hills, before my dad grew impatient (I keep kidding him that he's not a real ham because of his lack of interest in getting active on the air). Fortunately, I had gotten at least one contact under my belt from that club station. The only thing missing was talking to the ship itself, at least for myself; my dad, as always, missed the point entirely. The club trustee said it was no problem; they were active on HF on a regular basis. Having missed them on HF for over a decade, I thought I'd better hedge my bets — this is where the creative operating came in. Shortly after I got back home, I was able to proudly show off a QSL card from the *Queen Mary*. I had worked the club station from the parking lot on two meters with my HT. I wonder how many others can boast that they worked the *Queen Mary* while using a rubber duck and less than two watts? Of course, hoping to encourage my dad into becoming a more active ham, I had held the HT up to his face two seconds after I made my contact, so he could also earn a QSL card from the *Queen*.

This was a time when handheld transceivers (HTs) had come into their own as viable radios, thanks to innovations seen in the mid- to late 1970s. Prior to this, portable transceivers were so bulky that they could not be worn clipped to a person's belt (or in the shirt pocket, as they developed in

the 1990s). Instead, they were so large that they were carried with a shoulder strap, similar to a woman's large purse. Thankfully they were already solid state by then; I shudder to think what portable tube gear would be like!

The weird and less weird

Vacations also can present unique operating challenges, especially if one looks for them (which I did). During our California trip, we hit the majority of tourist sites, which included Twin Peaks. There were many transmitter antennas right next to one of the peaks; I did it one better, and actually climbed to the top of one peak. 220 MHz had already become my favorite band by this point, and I had a fairly new 220 MHz HT. So, it was natural that I would try my DX contacts on that band. My first attempt got me into a repeater 80 miles away, with one watt and a 5/8-wavelength HT mounted antenna (I found out I could make it just as easily on low power as with high). The second contact on that band was to a repeater 30 miles away. I'm not sure what the distance records are for portable 220 MHz QRP, but I'd like to think we gave that record a good bit of competition.

Fortunately, there are also unique opportunities for operating in what the uninitiated might call "less weird" (as if we ever really got all that weird!). Thanks to a father who had been a private pilot for many years, I had the chance to operate aeronautical portable on several occasions. Back then (the 1980s and very early 1990s), things were still a bit more relaxed than today, as long as the ham equipment was independent of the aircraft's electrical and radio systems (my HTs certainly were), and caused no interference with aircraft operation. My dad and I carefully confirmed this, and I got the pilot's permission well in advance. There was no problem with amateur operations on an aircraft. My initial attempts included two band operation, two meters and 220 MHz. Distances achieved on both bands were relatively similar, and there were a few people on both bands in the area that seemed pleasantly surprised at the

chance to work a station that was aeronautical portable. Some thought it was aeronautical mobile, until I explained I was using a portable radio, portable antenna, portable power supply in the form of battery packs, with the associated power levels, there was certainly nothing mobile with the actual communications equipment being used. After that initial test, subsequent operation took place exclusively on 220 MHz, although by then a few people in northern Illinois and southern Wisconsin were getting used to aeronautical operation from a full-fledged mobile operator.

This came in the form of the owner of the Amateur Electronic Supply store in Milwaukee, Wisconsin. He had outfitted a business jet with a complete ham station; he'd take his friends along on flights and let them operate, usually reserving 220 MHz operation for himself. A few of the other regulars on 220 and myself looked forward to hearing him, and he got to recognize a few of us, too. Thanks to him, I received an invitation to tour his store and to come along on a future ride on his jet. Unfortunately I never had the opportunity to avail myself of the jet invitation, but when my dad and I took my cousin (who was visiting from Germany) to see the store, all three of us got the store tour. I later found out the owner got mad at not being told I was there; he had been in a meeting when we arrived, and we didn't want to interrupt him. It's unfortunate I never had the chance to take a look at his airplane; for permanent set-ups like that for the amateur radios, FAA approval had to be granted. To receive that, it had to be an impressive setup!

Fun times

Of course, even the more straight-laced operating can have it's moment of fun. Just like I had to clarify to a few operators what I meant by "aeronautical portable" operation, a similar situation occurred when a sailboat owner made an appearance on one of the 220 MHz repeaters I frequented. I took that opportunity to sign "maritime portable," and he lost no time asking if I was swimming because I didn't

sound out of breath. Quite calmly I told him I was using my HT while in the bathtub, with a squeak or three from my rubber ducky (the yellow floating type, not the antenna on the radio) added in the background, for good measure.

The more subtle humor was not exempt from amateur radio, either. Before Ken's less-than-ideal health took its toll, we were known to head out the door to a mutually interesting event at a moment's notice. One such early event was a Fourth of July fireworks display he had heard about. This was one of the few times he drove, giving me the chance to grab the microphone and indulge in some 220 MHz activity, occasionally relaying a few messages from Ken to mutual friends. I'm not sure how we got around to the discussion of girlfriends, but at one point I admitted to a bit of bashfulness with women. Remembering my earlier comment about how I had been in the habit of carrying my 220 MHz HT with me, our friend Cliff WA9PDM, suggested that I wear a jacket over the HT's speaker/microphone, and we'd do a modern version of Cyrano de Bergerac, with Cliff taking the part of Cyrano.

Innocent bystanders aren't necessarily exempt from becoming victims of ham shenanigans, either (and I'm sure

this one's not an isolated case), this one involving a bit of wordplay. Friends of my parents were traders and sellers in the model and toy train industry. While they were selling at the local county fair grounds, the husband of that husband / wife team saw a sign, "HAMFEST", with an arrow pointing in the appropriate direction. He figured he would not have to worry about lunch; he'd just grab a slice of a porker, throw some bread around it, and be all set. When relating this story to my mom, she already had started grinning at this point of his story; laughter, being contagious, got her friend laughing so hard that he could barely finish the story of how he ended up at a ham radio flea market.

In spite of all of the activities caused by, or centered on, amateur radio operations, it seems surprising how few of these events required actual use of radio gear as a part of the actual activity. For example, even though I met Joe W9CYT through my operations on 220 MHz, the socializing that took place both with just Joe or with Joe and his wife did not mean we used radios as part of our socializing, nor did we always utilize radios as a communications link for our outings. I remember several lunch gatherings, discussions at his home, and hamfests as prime examples. The same can be

said of other friendships that developed through amateur radio; hamming was simply the catalyst. Ken and I, along with the occasional high school friends of mine whom we included, took part in several nature hikes, and all-night "brainstorming" sessions in the early years of my ham career.

These brainstorming sessions, if they can be called that, were an unusual twist to the raucous gatherings typical of high school- and college-aged people (we were at the late edge of the latter, when we started this type of get-togethers). Instead of launching on an entire night of carousing, drinking, and general troublemaking, we'd start off with something mundane, like enjoying the latest movie release on video, then proceed to tear it to shreds (regular reviewers couldn't hold a candle to us). Not only would we end up picking it to pieces, we'd end up creating rewrites. Somewhere through our discussion of rewrites, the discussions would take more than the usual amounts of twists and turns, debates about the script would take a side track through film-making (photography); before we were finished (at about three o'clock in the morning, after a start at about four in the afternoon), we would end up discussing something bizarre like the UFO phenomena after having watched a movie not even remotely related to that topic. After the fact, no one could remember how we got from one to the other, except that we had so much fun with a variety of interesting topics, we typically lost all track of time. How often can it be said that such a wide range of topics gets covered in just one party? It certainly made for some unusual, if not legendary, gatherings.

Not all get-togethers were that cerebral; there were a fair share of gatherings that tended to go from the bizarre to nearly slapstick in comedic quality. Here's a typical example: After a full day of some other activity, Ken and I decided to catch the latest science-fiction thriller in a local theater. For some reason, the previous function we were at ended early, allowing us a bit of extra free time once we got to the theater. There wasn't enough time to



Photo A. Assistant operator "Fluffy" maintains a listening watch while Klaus WB9YBM makes a run for coffee.

go anywhere else, and I wasn't about to just sit in the car. Then I realized I had a kite in the trunk of my car (this was way back when I still drove the 1974 Mercury Comet, which was slightly more prone than more recent cars to have curious odds and ends collecting in the trunk). Ken was already unleashing a nervous laugh as he saw my insane grin, knowing full well by now that these looks clearly indicated I had something up my sleeve. I wasn't about to make an exception in this case. It developed into peals of laughter as we launched the kite — black, with dark blue trim — into the night sky. That was not to be the end of it, though; a young-ish police officer, cruising the parking lot, started asking what we were up to. Fortunately, he was able to get into the spirit of things and tried to pick out the black kite against the now-black night sky. By now, other theater patrons were getting into the act, wondering what the officer was looking for with the squad car search light, and joining in the fun. By following the white string upwards at the proper angle, it was soon found. Realizing we were harmless, he joined us in a good laugh, and soon left. Luck was not with us for long, though; a short while later, a squad car with an older officer rolled up. Again we were asked what was going on. I'm not sure if, being older, he was being a "cranky curmudgeon," or if he was just having a bad day, but we were shortly convinced to get rid of the kite. I made sure to turn around, hold the kite in front of the squad car's headlights (even pointing to the offending kite), to let him know it was down, and on the way back to the trunk of my car. Fortunately, by now it was within about ten minutes of the movie's start, and no need to kill any more time. Even though the movie was good, it seemed like a bit of a let-down after our brush with the law. Although amateur radio, with its versatile nature, can be an interest all unto itself, one can immerse oneself in any subset of interests without fear of boredom. There are times, such as this, when events happen and experiences are shared with others and the line dividing

amateur radio and everything else can certainly blur.

While much is written about DXpeditions — radio expeditions to long-forgotten islands and such — one thing that needs to be clarified is that not all expeditions need to be to far-off or exotic places in order to be either interesting or of value to amateur radio. The aeronautical mobile operation mentioned earlier was only one example. Operating into different states from a single operating point well within Illinois, with nothing more than an HT and rubber duck antenna, was made possible through a trip into downtown Chicago. Operating from the observation deck of the Sears Tower allowed operation well into Michigan and Indiana. The lack of complexity of this expedition made it all the more fun. Of course, this was back in the 1980s; increased security and suspicion harbored by the current security guards has probably made even a simple undertaking like that more difficult. At least, it has shown us that expeditions do not need to haul along a warehouse of equipment in order to be successful, in spite of what the magazine pictures of other expeditions showed.

Not all of these expeditions had phenomenal results. In the late 1990s, initially hoping to gain permission to operate from the top of the lighthouse in Evanston, Illinois, operation was denied based on their insurance restrictions. Although all I was planning to take up was a 5-element beam built by Joe, a mobile radio, and power supply, they said insurance regulations would not allow it in spite of tours being given in the lighthouse during the tourist season. Not to be daunted, though, January 2002 saw a field test site go up in the parking lot right next to the lighthouse. In spite of the lack of height, the parking lot and nearby observation deck were about twenty feet or so above Lake Michigan; a tripod and wood support held the beam approximately ten feet farther up. Although there was a reasonably clear shot to the lake itself, about 50 feet or so east of the antenna, contacts into the state of Michigan remained illusive, as

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did contacts north along the coastline into Wisconsin. Fortunately, there was better luck to the southeast, when the Valparaiso area of Indiana was heard. Inland range was also surprisingly good; with five watts into the antenna, a repeater about 40 to 50 miles to the west was accessed. It did not even take a whole squadron of amateur radio operators for the entire operation; my mom and I set the tripod up next to the car, and that was all we needed for the test.

While high sites for repeaters are sought after to maximize the communications range of repeaters, with plenty of bragging taking place by the owner when a coveted site is obtained, there are examples of bragging not being a good idea. One amateur employed in site installation on the Sears Tower in Chicago sneakily put his own repeater on the building, insisting on short transmissions and discouraging use of his machine by anyone but his closest friends. Since the repeater owner (according to a few sources) had no official permission to use that site for his repeater, he didn't want anyone to catch on to where the repeater was. Listening to the conversations and running a few very discrete tests on their own, other hams were able to conclude with reasonable certainty that the repeater was indeed on the Sears Tower. The repeater has since left the air, or at least that site. With the increase in RF signals since that time (the repeater was up briefly in the 1980s), it probably would have suffered from an overload in signals had it stayed on the air from that location.

Bedsprings and flagpoles

Even with the antenna legislation taking place in the 1990s to make city ordinances more "user friendly" to the amateur radio community, the process to allow antenna support structures has been notoriously slow. Over the years, I've heard several different methods by some very creative hams, and I'm sure there are more in circulation that haven't fully made the rounds yet. Loading up things like bedsprings and the radiators in homes circulating heating water for the winter were certainly

the more unusual, and not something I would recommend, out of safety concerns.

My favorite was told to me by a gentleman I spoke to on forty meters, relatively early in my ham career. He was living in a trailer park that did not allow antennas, although they did allow flagpoles. He had bought an extra-long fiberglass flagpole, receiving compliments on his patriotism for the extent he went to with this construction. Unknown to everyone else at the trailer park, though, was that he ran an antenna wire down the whole length of the flagpole, on the inside. On the bottom, he very discreetly put a ground rod next to the pole, attaching his coax center conductor to the antenna wire and the braid to the earth ground. Then, the coax was routed underground from the flagpole to under the trailer home, where he had his ham shack. The coax run from below-ground to inside his trailer was done underneath the trailer, where no one would see it. With an antenna tuner, he was able to work all his favorite bands.

My own antenna efforts had not been nearly as sneaky, although I still had to take advantage of a technical loophole. The city where I lived did not allow antenna towers. Fortunately, my parents' house still had a standard brick chimney, big and solid enough to mount a mast to. This led to the inverted "V" I used on 40 and 15 meters for many years, and a VHF antenna stuck to the top of the mast. Since the mast was not a permanent structure as the tower would be (at least in the estimation of the city), we had found an effective loophole to the antenna restrictions. Even if the city would have complained (they never did), it would have been very easy to take the antennas down for a few months — just long enough to appease the local government — and then discreetly put them back up a few weeks, or months, later. During the last few years when I was living at home, the occasional tuck-pointing of the chimney became necessary, with my dad complaining that the vibrations of the antenna mast caused during periods of high wind were to blame for the mortar between

the bricks beginning to deteriorate. He was kidding me that he should charge me for chimney repair; my reply was that I'd charge him for renting him my antennas — the chimney straps were the only thing holding the chimney together!

Basic concept

The public service aspect of amateur radio has shown itself to be a mixture of expected, and unexpected. The write-ups I've seen over the years in magazines, of amateurs providing communications at bicycle races, for instance, is certainly expected given the service aspect of amateur radio. What was unexpected for me was, at times, lack of service, when fellow hams failed to live up to the basic concept of this aspect of amateur radio. One such example took place in the early 1990s, when I saw a serious accident on an expressway. Attempts to get help from my mobile during ten minutes of calling for assistance on several different repeaters brought either total silence or apathy. I put the quick-connect citizens band antenna on my car, and got help on the first try. Again on the plus side, though, I've also been witness firsthand to the generosity of hams. While driving home in bad weather, Joe was the first to voluntarily postpone dinner in order to make sure I got home safe. When I told him I needed to take a break from the conversation to concentrate on the road and keep both hands on the wheel, his only request was for me to let him know when I got home, so he could have dinner. A few times I'd hedge my bets by telling him to go ahead to dinner even though I was still a mile or so from home; at that point I either could've walked home, or ducked into a nearby store to grab a taxi.

This is not to say I haven't been on the other side of the equation: I remember once I made the twenty-five mile trek home from work, only to get a call on the air from a ham a dozen miles past home, saying he needed a ride because his car broke down and

Continued on page 57

Hamfest Improvement 101

How to make things better for everybody.

What bothers you the most about hamfests? For any number of people you ask, you'll probably get at least twice as many suggestions for improvements. Since we want to keep answers to something practical for an article, let's filter out just a few suggestions specific to the basic function of what a hamfest is, and how to make it more successful.

Kee in mind that these ideas will vary a bit, to stay in line with the specific needs of any given hamfest. The size, type, and location of a hamfest will play a role in what it takes to make a hamfest successful. Let's take a look at a few universal constants that may lend themselves to any hamfest.

Your crew

Who's going to help you put on the hamfest? While you might be a genius at acquiring a site, coordinating details, and getting out the word about the event, there's the "human factor" that quite often gets neglected. At several hamfests I've been treated rudely by the guys in the orange vests directing traffic — your first line of contact between your organization and the attendees. The attendees are the ones leaving their money at the gate, to get in; they're also the ones telling their friends if your hamfest is worth getting to, or not. What's it worth putting your best foot forward? If you have someone with an "attitude" helping your club, you might want to consider putting him on kitchen duty — any place but out there offending the patrons!

Access

Most clubs have the 'fest location down pretty well, and the ones around here at least can manage to find a large open area where parking and display areas have plenty of room. There's still another form of access to be considered: radio access. Most clubs have a talk-in frequency on the club's repeater.

This is great if you're holding the hamfest in an area where the guy with a hand-held from inside his car can access the machine, but in most cases this isn't going to happen. Some of the smarter hamfests I've seen have two talk-in frequencies: one on the repeater (local ones aren't always available, so don't count on one being available in the place you're holding the hamfest), and a second frequency on simplex nearer the hamfest grounds. This serves a dual purpose in that once people get close to the hamfest grounds (usually at the county fairgrounds well outside of a city), by then out of range of the repeater, they can find extra help in getting to the hamfest grounds — in addition to leaving the repeater free to talk-in people coming from out of town.

At this point, we're still neglecting everything but the club's favorite band. Let's face it: No matter how much you like two meters, not everyone's going to flock to that band just on your say-so, especially not for the duration of only one or two hamfests per year. If you want to reach out to more attendees, talk to your club members and see who's got what for the other bands. If you can't get a member to loan you their 220 MHz (or 440 MHz) gear for another talk-in frequency, possibly you can encourage them to volunteer their services to operate their own gear during your event. If you want to get really creative (which might be especially necessary if you've got only one volunteer at a time to monitor all simplex talk in frequencies at once), you might want to consider wiring up a simple link between your transceivers and linking everything to one common frequency or local microphone.

Getting the word out

A few of the newer modes of operation that have sprung up over recent years can provide options to get the word out about a hamfest. Getting the information to the ham magazines is

most common, although the biggest mistake people may make is not realizing how far in advance they need it. Remember, the magazine has to get set up, shipped to the printers, and distributed all in time to get to people on time. Typically a two-month lead time is the minimum. The more industrious ham clubs will even send out members armed with fliers about their hamfest, to distribute at other hamfests. With all of the print shops springing up everywhere, finding one that can handle the quantity you need at the price you're willing to pay should not be difficult. I've even seen clubs do direct mailing of their fliers.

A less common form of getting the word out is packet radio, probably because a lot of the "old-timers" in various repeater groups haven't gotten comfortable with "them newfangled contraptions." The main cautionary

note is to limit distribution to only your end of the state, using commands like "NORIL" for northern Illinois; check with the head honcho of your local node if you're not sure how to do it. Some node trustees have been known to get mad at superfluous messages. One thing I noticed is that the wider an area a message is flooded across, the shorter the time the message will be saved by the packet boards. Keep this in mind as you try to achieve a balance between giving people enough advance notice to be able to plan to attend, and telling them so far in advance that they have time to forget about it.

Another technique that's slowly been catching on, which could stand to be used more often, is that many television and radio stations have free public service announcements (and you certainly can't beat that price!) that tell about upcoming events. I've

seen a pretty good variety of events being mentioned, from church picnics to model boat races and pretty much everything in between.

Conclusion

I realize not everyone is a "people person," either willing or able to practice positive public relations with the general population; this certainly provides a set of challenges to putting on a hamfest. In spite of this, there are plenty of ways we can improve what it is we're doing, as shown by the suggestions I've discussed. I'm sure there are a few I might have missed; I'd enjoy seeing those in a future "letter to the editor" (let's share them so we can all benefit!). I'm also curious to see what luck your club may have with the suggestions discussed in this article; feel free to drop me a note with your results.

73

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Photo A. Frank WB9OHN provides entertainment as a clown for the kids.

Pluses and Minuses of “Smart” Batteries

*We charged one of the world's leading experts with explaining,
and here's his plug ... er, report.*

A speaker at a battery seminar remarked that, “The battery is a wild animal and artificial intelligence domesticates it.” An ordinary or “dumb” battery has the inherent problem of not displaying the amount of reserve energy it holds. Neither weight, color, nor size provide an indication of the battery's state-of-charge (SoC) and state-of-health (SoH). The user is at the mercy of the battery when pulling a freshly charged battery from the charger.

Help is at hand. An increasing number of today's rechargeable batteries are being made “smart.” Equipped with a microchip, these batteries are able to communicate with the charger and user alike to provide statistical information. Typical applications for “smart” batteries are notebook computers and video cameras. Increasingly, these batteries are also used in advanced biomedical devices and defense applications.

There are several types of “smart” batteries, each offering different complexities, performance, and cost. The most basic smart battery may only contain a chip to identify its chemistry and tell the charger which charge algorithm to apply. Other batteries claim to be smart simply because they provide protection from overcharging, underdischarging and short-circuiting. In the eyes of the Smart Battery System (SBS) forum, these batteries cannot be called “smart.”

What makes a battery “smart”? Definitions still vary among organizations and manufacturers. The SBS forum states that a smart battery must be able to provide SoC indications. In 1990, Benchmarq was the first company to

commercialize the concept of the battery fuel gauge technology. Today, several manufacturers produce chips to make the battery “smart.”

During the early nineties, numerous “smart” battery architectures emerged. They range from the single-wire system to the two-wire system and the system management bus (SMBus). Most two-wire systems are based on the SMBus protocol. Let's look at the single-wire system and the SMBus.

The single-wire bus

The single-wire system is the simpler of the two and delivers the data communications through one wire. A battery equipped with the single-wire system uses only three wires: the positive and negative battery terminals and the data terminal. For safety reasons, most battery manufacturers run a separate wire for temperature sensing.

Fig. 1 shows the layout of a single-wire system.

The modern single-wire system stores battery-specific data and tracks battery parameters, including temperature, voltage, current, and remaining charge. Because of simplicity and relatively low hardware cost, the single-wire enjoys

market acceptance for high-end mobile phones, two-way radios, and camcorders.

Most single-wire systems do not have a common form factor; neither do they lend themselves to standardized

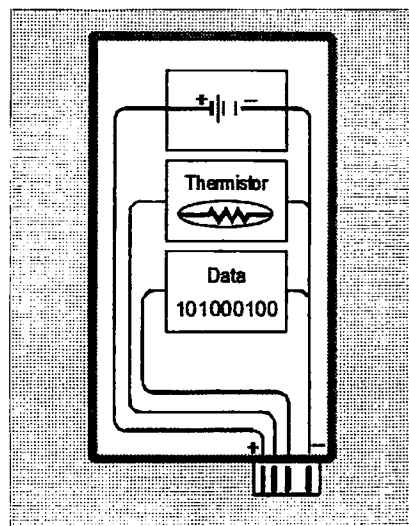


Fig. 1. Single-wire system of a “smart” battery. Only one wire is needed for data communications. Rather than supplying the clock signal from the outside, the battery includes an embedded clock generator. For safety reasons, most battery manufacturers run a separate wire for temperature sensing.

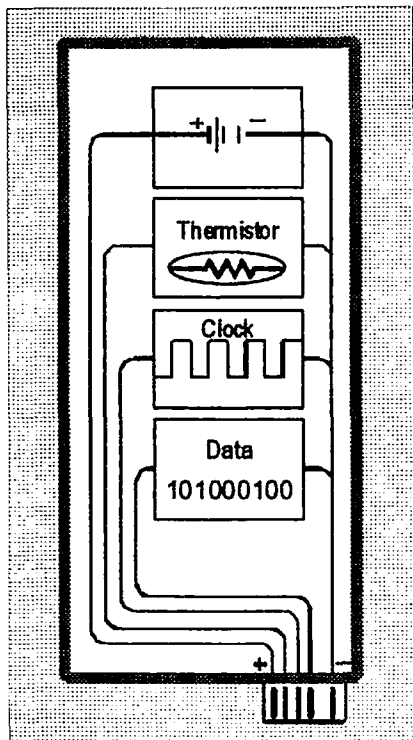


Fig. 2. Two-wire SMBus system. The SMBus is based on a two-wire system using a standardized communications protocol. This system lends itself to standardized state-of-charge and state-of-health measurements.

SoH measurements. This produces problems for a universal charger concept. The Benchmark single-wire solution,

for example, cannot measure current directly; it must be extracted from a change in capacity over time.

On a further drawback, the single-wire bus allows battery SoH measurement only when the host is "married" to a designated battery pack. Such a fixed host-battery relationship is feasible with notebook computers, mobile phones, or video cameras, provided the appropriate OEM battery is used. Any discrepancy in the battery type from the original will make the system unreliable or will provide false readings.

The SMBus

The SMBus is the most complete of all systems. It represents a large effort from the portable electronics industry to standardize to one communications protocol and one set of data. The SMBus is a two-wire interface system: One wire handles the data; the second is the clock. It uses the I²C defined by Philips as its backbone.

The Duracell/Intel SBS, which is in use today, was standardized in 1993. In previous years, computer manufacturers developed their own proprietary "smart" batteries. With the new SBS specification, a broader interface standard is made possible. This reduces the hurdles of interfering with patents and

intellectual properties. **Fig. 2** shows the layout of the two-wire SMBus system.

In spite of the agreed standard, many large computer manufacturers, such as IBM, Compaq, and Toshiba, have retained their proprietary batteries. The reason for going their own way is partly due to safety, performance, and form factor. Manufacturers claim that they cannot guarantee safe and enduring performance if a nonbrand battery is used. To make the equipment as compact as possible, the manufacturers explain that the common form factor battery does not optimally fit their available space. Perhaps the leading motive for using their proprietary batteries is pricing. In the absence of competition, these batteries can be sold for a premium price.

The objective behind the SMBus battery is to remove the charge control from the charger and assign it to the battery. With a true SMBus system, the battery becomes the master and the charger serves as a slave that must follow the dictates of the battery. This is based on concerns over charger quality, compatibility with new and old battery chemistries, administration of the correct amount of charge currents, and accurate full-charge detection. Controlled charging makes sense when considering that some battery packs share the same footprint but contain different chemistries.

The SMBus system allows new battery chemistries to be introduced without the charger becoming obsolete. Because the battery controls the charger, the battery manages the voltage and current levels, as well as cut-off thresholds. The user does not need to know which battery chemistry is being used.

An SMBus battery contains permanent and temporary data. The permanent data is programmed into the battery at the time of manufacturing and includes battery ID number, battery type, serial number, manufacturer's name, and date of manufacture. The temporary data is acquired during use and consists of cycle count, user pattern, and maintenance requirements. Some of the temporary data is being



Photo A. 35- and 202-series "smart" batteries featuring SMBus. Available in NiCd, NiMH, and Li-ion chemistries, these batteries are used for laptops, biomedical instruments, and survey equipment. A non-SMBus ("dumb") version with same footprint is also available.

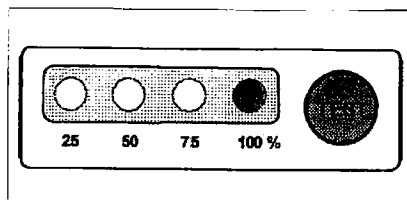


Fig. 3. State-of-charge readout of a "smart" battery. Although the state-of-charge is displayed, the state-of-health and its predicted runtime are unknown.

replaced and renewed during the life of the battery.

The SMBus is divided into Level 1, 2, and 3. Level 1 has been eliminated because it does not provide chemistry-independent charging. Level 2 is designed for in-circuit charging. A laptop that charges its battery within the unit is a typical example of Level 2. Another Level 2 application is a battery that contains the charging circuit within the pack. Level 3 is reserved for full-featured external chargers.

External Level 3 chargers are complex and expensive. Some lower-cost chargers have emerged that accommodate SMBus batteries but are not fully SBS-compliant. Manufacturers of SMBus batteries do not fully endorse this shortcut. Safety is always a concern,

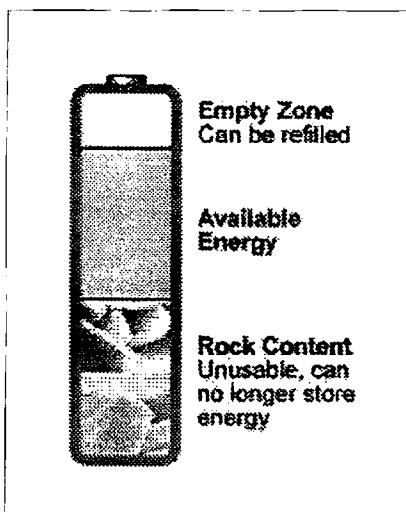


Fig. 4. Battery charge capacity. Three imaginary sections of a battery consisting of (top to bottom) available energy, empty zone, and rock content. With usage and age, the rock content grows. Without regular maintenance, the user may end up carrying rocks instead of batteries.

but customers prefer these economy chargers because of lower price.

Serious industrial battery users operating biomedical instruments, data collection devices, and survey equipment, use Level 3 chargers with full-fledged charge protocol. No shortcuts are applied. To ensure compatibility, the charger and battery are matched and only approved packs are used. The need to test and approve the marriage between a specific battery and charger is unfortunate, given that the "smart" battery is intended to be universal.

Among the most popular SMBus batteries for portable computers are the 35 and 202 form factors. Manufactured by Sony, Hitachi, GP Batteries, Moltech, Moli Energy, and many others, these batteries work (should work) in all portable equipment designed for this system. **Photo A** shows the 35- and 202-series "smart" batteries. Although the 35 has a smaller footprint than the 202, most chargers accommodate both sizes. A non-SMBus ("dumb") version with the same footprint is also available.

Negatives of the "smart" battery

The "smart" battery has some notable downsides, one of which is price. An SMBus battery costs about 25% more than its "dumb" equivalent. In addition, the "smart" battery was intended to simplify the charger, but a full-fledged Level 3 charger costs substantially more than a regular dumb model.

A more serious drawback is maintenance requirements, better known as capacity relearning. This is needed on a regular basis to calibrate the battery. The engineering manager of Moli Energy, a large Li-ion cell manufacturer, commented, "With the Li-ion we have eliminated the memory effect, but are we introducing digital memory with the SMBus battery?"

Why is calibration needed? The answer is to correct the tracking errors that occur between the battery and the digital sensing circuit during use. The most ideal battery use, as far as fuel-gauge accuracy is concerned, is a full charge followed by a full discharge at a constant IC rate. In such a case, the tracking error would be less than 1% per cycle. In real life, however, a battery may be discharged for only a few minutes at a time and commonly at a lower C-rate than IC. Worst of all, the load may be uneven and vary drastically. Eventually, the true capacity of the battery no longer synchronizes with the fuel gauge and a full charge and discharge is needed to "relearn" or calibrate the battery.

How often is calibration needed? The answer lies in the type of battery application. For practical purposes, a calibration is recommended once every three months or after every 40 short cycles. Long storage also contributes to errors because the circuit cannot accurately compensate for self-discharge. After extensive storage, a calibration cycle is recommended prior to use.

Many batteries undergo periodic full

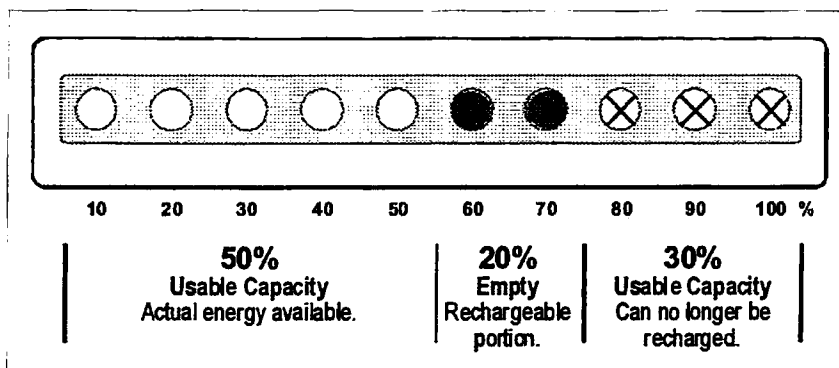


Fig. 5. Tri-state fuel gauge. The Battery Health Gauge reads the "learned" battery information available on the SMBus and displays it on a multicolored LED bar. The illustration shows a partially discharged battery of 50% SoC with a 20% empty portion and an unusable portion of 30%.

discharges as part of regular use. If this occurs regularly, no additional calibration is needed. If a full discharge reset has not occurred for a few months and the user notices the fuel gauge losing accuracy, a deliberate full discharge on the equipment is recommended. Some intelligent equipment advises the user when a calibrating discharge is needed. This is done by measuring the tracking error and estimating the discrepancy between the fuel gauge reading and that of the chemical battery.

What happens if the battery is not calibrated regularly? Can such a battery be used in confidence? Most "smart" battery chargers obey the dictates of the chemical cells rather than the electronic circuit. In this case, the battery will fully charge regardless of the fuel gauge setting. Such a battery is able to function normally, but the digital readout will become inaccurate. If not corrected, the fuel gauge information simply becomes a nuisance.

An additional problem with the SMBus battery is noncompliance. Unlike other tightly regulated standards, the SMBus protocol allows some variations. This may cause problems with existing chargers and the SMBus battery should be checked for compatibility before use. Ironically, the more features that are added to the SMBus charger and battery, the higher the likelihood of incompatibilities.

The need to test and approve the marriage between a specific battery and charger is unfortunate, given the assurance that the SMBus battery is intended to be universal. Ironically, the more features offered on the SMBus charger and the battery, the higher the likelihood of incompatibilities.

The state-of-charge indicator

Most SMBus batteries are equipped with a charge level indicator. When pressing an SoC button on a battery that is fully charged, all signal lights

illuminate. On a partially discharged battery, half the lights illuminate, and on an empty battery, all lights remain dark. **Fig. 3** shows such a fuel gauge.

While SoC information displayed on a battery or computer screen is helpful, the fuel gauge resets to 100% each time the battery is recharged, regardless of the battery's SoH. A serious miscount occurs if an aged battery shows 100% after a full charge, when in fact the charge acceptance has dropped to say 50% or less. The question remains: "100% of what?" A user unfamiliar with this battery

has little information about the runtime of the pack.

How can the three levels of a battery be measured and made visible to the user? While the SoC is relatively simple to produce, measuring the SoH is more complex. Here is how it works:

At time of manufacture, each SMBus battery is given its specified SoH status, which is 100% by default. This information is permanently programmed into the pack and does not change. With each charge, the battery resets to the full-charge status. During discharge, the energy units (coulombs) are counted and compared against the 100% setting. A perfect battery would indicate 100% on a calibrated fuel gauge. As the battery ages and the charge acceptance drops, the SoH begins to indicate lower readings. The discrepancy between the factory-set 100% and the actual delivered coulombs on a fully discharged battery is used to calculate the SoH.

Knowing the SoC and SoH, a simple linear display can be made. The SoC is indicated with green LEDs; the empty part remains dark; and the unusable part is shown with red LEDs. **Fig. 5** shows such a tri-state fuel gauge. As an alternative, the colored bar display may be replaced with a numeric display indicating SoH and SoC. The practical location to place the tri-state fuel gauge is on the charger.

The target capacity selector

For users who simply need a go/no go answer, chargers are available that feature a target capacity selector. Adjustable to 60%, 70%, or 80%, the target capacity selector acts as a performance check and flags batteries that do not meet the set requirements.

If a battery falls below target, the charger triggers the condition light. The user is prompted to press the condition button to calibrate and condition the battery by applying a charge/discharge/charge cycle. If the battery does not recover, a fail light indicates that the battery should be replaced. The green ready light at the end of the service reveals full charge and ensures that the battery meets the

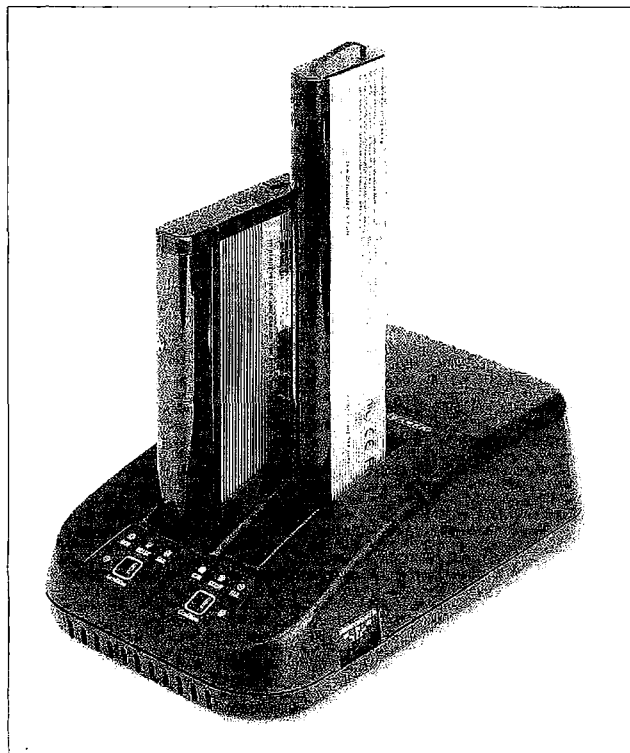


Photo B. The Cadex SM2+ charger. This Level 3 charger serves as charger, conditioner and quality control system. It reads the battery's true state-of-health and flags those that fall below the set target capacity. Each bay operates independently and charges NiCd, NiMH, and Li-ion chemistries in approximately three hours. "Dumb" batteries can also be charged, but no SoH information is available.

required performance level. **Photo B** illustrates a two-bay Cadex charger featuring the target capacity selector and discharge circuit. This unit is based on Level 3 and services both SMBus and "dumb" batteries. SoH readings are only available when servicing SMBus batteries.

By allowing the user to set the desired battery performance level, the question is raised as to what level to select. The answer is governed by the applications, reliability standards, and cost policies.

A practical target capacity setting for most applications is 80%. Decreasing the threshold to 70% will lower the performance standard but pass more batteries. A direct cost saving will result. The 60% level may suit those users who run a low budget operation, have ready access to replacement batteries, and can live with shorter, less predictable runtimes. It should be noted that the batteries are always charged to 100%, regardless of the target setting. The target capacity simply refers to the amount of charge the battery has delivered on the last discharge.

Summary

SMBus battery technology is predominantly used for higher-level industrial applications. Improvements in the "smart" battery system, such as higher accuracies and self-calibration will likely increase the appeal of the "smart" battery. Endorsement by large software manufacturers such as Microsoft will entice PC manufacturers to make full use of these powerful features.

"Smart" battery technology has not received the widespread acceptance that battery manufacturers had hoped for. Some engineers go so far as to suggest that the SMBus battery is a "misguided principle." Design engineers may not have fully understood the complexity of charging batteries in the incubation period of the "smart" battery. Manufacturers of SMBus chargers are left to clean up the mess.

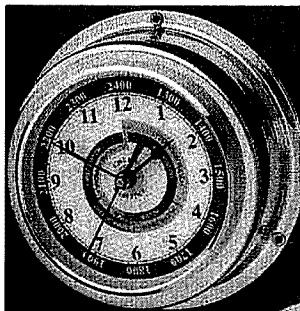
One main drawback of the "smart" battery is high price. In the early 1990s, when the SMBus battery was conceived, price was not as critical as it is today. Now, buyers want scaled down products that are economically priced and perform the functions intended. In the competitive mobile phone market, for example, the features offered by the SMBus would be considered overkill.

In spite of teething problems and relative high costs, the "smart" battery will continue to fill a critical market segment. Unless innovative improvements are made and manufacturing costs are drastically reduced, this market will be reserved for high-level industrial applications only.

About the author

Isidor Buchmann is the founder and CEO of Cadex Electronics Inc., in Richmond (Vancouver), British Columbia, Canada. Mr. Buchmann has a background in radio communications and has studied the behavior of rechargeable batteries in practical, everyday applications for two decades.

Continued on page 58



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CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the July issue, we should receive it by April 30. Provide a clear, concise summary of the essential details about your Calendar Event.

MAR 18-MAY 31

WALL TOWNSHIP, NJ A series of OMARC-sponsored amateur radio classes began March 18th and will run through the end of May. Classes will be held at the InfoAge Center OMARC Diana site, Building 9116 on Marconi Rd., Wall Township. All classes will begin promptly at 6:30 p.m. each Tuesday night for the duration of the course. For directions to the site visit the Web at [<http://www.qsl.net/n2moj>]. For additional details on the classes and to sign up in advance, please contact Larry KB2RIS at [kb2ris@wmconnect.com], or Donna KC2GKQ at [dwilkins59@wmconnect.com]. VE exams are being offered to the public, at the same location, starting at 10 a.m. on April 5th, June 7, August 2nd, October 4th, and December 6th.

APR 9

LAS VEGAS, NV The annual National Association of Broadcasters Ham Radio Reception will take place 6 p.m. to 8 p.m. during the NAB Convention on Wednesday, April 9th. The reception venue is the Hilton Hotel adjacent to the Las Vegas Convention Center. Again this year the reception is co-hosted by CQ Magazine and Kenwood Communications. Visit [www.cq-amateur-radio.com] for more information about the convention. On-line registration is at [www.nab.org/conventions].

APR 13

RALEIGH, NC The Raleigh ARS will present its 31st Hamfest and Huge Electronic Fleamarket in the Jim Graham Bldg. at NCS Fairgrounds, Sunday, April 13th, from 8 a.m. to 4 p.m. Wheelchair access. Meetings will be held for ARRL, MARS, ARES and NTS. Full QSL checking. All activities will be held inside. Advance tickets are \$5 each, \$6 at the door. Tables and booths will be available. Free parking. RVs welcome. There will be a Hospitality Supper Saturday night. VE exams, WA4GIR, 919-387-9152. For other questions and business contact Jeff Wittich AC4ZO, 211 Dundalk Way, Cary NC 27511; phone 919-362-4787. E-mail to [ac4zo@arri.net].

STOUGHTON, WI The Madison Area Repeater Assoc. will host the Madison Swapfest on Sunday, April 13th, at Mandt Community Center, Stoughton Junior Fair Grounds, on South Fourth St. Doors open at 8

a.m. Talk-in on 147.15. For more info contact Madison Area Repeater Assoc., P.O. Box 8890, Madison WI 53708-8890. Phone 608-245-8890. For fast access to more info, check the Web site at [<http://www.qsl.net/mara/>].

APR 19

MORGANTON, NC The 6th annual Catawba Valley Hamfest will be held Saturday, April 19th, starting at 8 a.m. at the Burke County Fairgrounds in Morganton NC. Lots of indoor and outdoor vendor space and free parking. The grand prize is a Yaesu FT-897. Check [www.cvhamfest.org] for complete details. This hamfest is being sponsored by the McDowell ARA and the Western Piedmont ARC.

APR 26

SONOMA, CA The Valley of the Moon ARC, W6AJF, will hold its annual ARRL Hamfest Saturday, April 26th, from 8 a.m. to noon. The hamfest will be held at the Sonoma Valley Veteran's Memorial Bldg., 126 First St. West, Sonoma CA, just one block north of the central Sonoma Plaza. Admission is free and hams are encouraged to bring the entire family. Registration for walk-in VE exams starts at 9 a.m. Testing for all license elements begins at 10 a.m. There will be an electronics swap meet with both indoor and outdoor spaces available. Setup will start at 7 a.m. Spaces \$10 each. Space for informational tables and displays will be made available at no charge for amateur radio organizations. The club will serve a full breakfast from 8 to 10 a.m., including eggs, pancakes, sausage, juice, and coffee or tea for \$5. Demonstrations will include an operating QRP station, AMSAT, a display of home-brewed equipment, and a beginners' DF transmitter hunt. VOMARC members will be on hand to help visiting hams register with the FCC through the Universal Licensing System so they can renew licenses and upgrade. VOMARC will also be participating in the "QRP to the Field" contest which will run during the hamfest. Guest operators are cordially invited to sit in and take a turn operating the club station. For a map and printed directions to the hamfest, send a business size SASE to VOMARC, 358 Patten St., Sonoma CA 95476. Talk-in will be on 145.35(-600) with a PL of 88.5. For more info call Darrel WD6BOR at 707-996-4494, or E-mail [wd6bor@vom.com].

WEST ORANGE, NJ The Irvington-Roseland Amateur Club will host an ARRL-sanctioned hamfest Saturday, April 26, 8:30 a.m. to 1 p.m. at West Orange High School, 600 Pleasant Valley Way, West Orange NJ. Talk-in on W2QR rpt. system, 146.415(+1.0) 85.4T; 224.480(-1.6) no tone; 447.875(-5.0) 156.7T or 146.520 simplex. The club Web page is at [www.qsl.net/k2gp]. Plenty of free parking. Ground level access. Rest room facilities. Food and refreshments. Something for everyone: amateur radio, computers, SWLers, electronic hobbyists. Admission is \$5 at the door, XYL/children under 12 admitted free. Pre-registered tables are \$12 for the first, \$9 for each additional. At the door tables are \$15 for the first and \$12 each additional. Add \$2 for limited number with electric. You must RSVP by April 11th; after that, first come first served. Sellers only admitted at 6:30 a.m. (no exceptions!). Special vendor parking lot. For more info, call Harvey Moskowitz W2YWC, at 973-994-0637; or E-mail [Harvmosk@aol.com].

APR 27

ARTHUR, IL The Moultrie Amateur Radio Klub will sponsor their 41st annual hamfest 8 a.m. to 12 p.m. at the Moultrie/Douglas County Fair Grounds on the south side of Arthur just off of Illinois Route 133, behind the high school. Talk-in will be on 146.055/.655 and 449.925/444.925 PL 103.5. Admission \$5 per person over the age of 14 years. Limited number of tables available at \$10 each, paid in advance. To reserve tables, or for info, write to M.A.R.K., P.O. Box 91, Lovington IL 61937; or call 217-543-2178 days and 217-873-5287 eves for info.

GALVA, IL The 4th annual W9YPS/AA9RO Hamfest will be hosted by the Area Amateur Radio Operators Club, 8 a.m. to 1 p.m. at the Galva IL National Guard Armory on 150 Morgan Rd. Advance 3-stub tickets \$5, 1-stub tickets \$7 at the door. 6 ft. tables \$10. Reserved tables not paid for by April 15th may be reassigned. Breakfast and lunch will be available. Talk-in on 145.490 - 88.5 PL. There is a large outdoor flea market area with handicap parking and the building is handicapped accessible. Some electricity is available, first come first served. Bring your own extension cords. Please contact [wd9hcf@arri.net] for details about VE exams. For more info contact Mat Bullock W9SIX, 419 College St., Kewanee IL 61443,

[mbullock@theramp.net]; Phil Imes WD9IRE, 908 Zang Ave., Kewanee IL 61443, [kewphii@cin.net]; or Bill Anderson WA9BA, 920 W. Division St., Galva IL 61434, [wa9ba@arrl.net].

MAY 3, 4

ABILENE, TX The Key City ARC will sponsor the ARRL West Texas Section Convention and its 18th annual Hamfest at the Abilene Civic Center, 1100 N 6th St., from 8 a.m. to 5 p.m. Saturday, and from 9 a.m. to 2 p.m. Sunday. Free parking. VE exams. Wheelchair access. Limited RV parking for a nominal fee. Tables \$7 each. Pre-registration \$7, must be received by April 29th; \$8 at the door. Talk-in on 146.160/.760. For reservations and info, contact Peg Richard KA4UPA, 1442 Lakeside Dr., Abilene TX 79602; phone 915-672-8889. E-mail to [ka4upa@arrl.net].

MAY 24

WINTERVILLE, NC The East Carolina Antique Radio Club Annual Swapfest will be held 8 a.m. to 3 p.m. at Kiwanis Club, 177 Forelines Rd., Winterville NC 28590. Free admission. Inside tables \$15, outside tailgate \$10, bring your own table/chairs. Setup will begin at 7 a.m. Drinks and hot dogs will be available. Contact Herman Schnur K4CTG, 3205 Brick Kiln Rd., Greenville NC 27858; phone 252-752-2264. E-mail [hschnur@cox.net]. Or contact William Engstrom, 218 Bent Creek Dr., Greenville NC 27834; phone 252-355-8732. E-mail [Wengstrom@vol.com].

MAY 31

WASHINGTON TOWNSHIP, NJ The Bergen ARA will sponsor its Annual Spring Hamfest on Saturday, May 31st, at the Westwood Regional Jr./Sr. High School, 701 Ridgewood Rd., Washington Township NJ. The location is approximately 15 minutes from the GW Bridge and 5 minutes from Paramus NJ. Talk-in on 146.19/.79. Vendors setup at 6 a.m. General admission 8 a.m. to 2 p.m. VE exams 8 a.m. to 10 a.m. only. DXCC card checking. Indoor and outdoor spaces are available. Lots of parking for tailgating. Admission is a \$5 donation (non-ham family members free). Vendors \$15 per space. Rest room facilities and refreshments available. For more info check the BARA Web site at [www.bara.org], or contact Jim Joyce K2ZO at [K2ZO@arrl.net], or call 201-664-6725.

SEP 25-28

SEATTLE WA Microwave Update 2003 organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25-28, 2003. Registrations for the joint conference will be accepted beginning April 1st. Cost of the registration will be \$40

prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be \$50. Registration forms can be downloaded at [www.microwaveupdate.org] or send an SASE to John Price N7MWV, 12026 81st Ave. NE, Kirkland WA 98034, and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to Microwave Update 2003. Joint conference sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are \$69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at 425-337-2900. Be sure to mention "Microwave Update" to get this rate. Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to Jim Christiansen K7ND, via E-mail at [k7nd@att.net]. MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to NU7Z [nu7z@aol.com]. For presentations at the Pacific Northwest VHF Conference sessions, contact N7CFO at [n7cfo@ix.netcom.com]. LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice.

SPECIAL EVENTS, ETC.

MAY 2-4

MARTHA'S VINEYARD, MA The Fall River ARC will be having its 10th Annual Martha's Vineyard Gay Head Lighthouse DXpedition (IOTA NA-046) starting 14:00 UTC May 2nd and ending 17:00 UTC May 4th. Listen for W1ACT on 14.260, 21.260, 28.460 and 146.550. SASE for a QSL card via Roland Daignault N1JOY, 19 Davis Rd., Westport MA 02790. He can be reached by E-mail at [n1joy@arrl.net].

MAY 10, 11

KANSAS The Kurt N. Sterba Strange Antenna Challenge will start Saturday, May 10th at 10 a.m. Central (15:00 UTC) and end Sunday, May 11th at 7 p.m. Central (01:00 UTC). Main freq: 28.500±20 kHz as per the OST listing. For more info check the Web at [http://www.leafwerks.net/n0ew/StrangeAntennas/k0s.html]. What are strange antennas? Use metal folding chairs, ladders, painting easels ... anything except wires or pipes. 73

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The Linux Nation

You might be just a little surprised, just as I was, at how many hams are already involved in using the Linux operating system in their shack computer. Once I started writing little blurbs about my experiences with Linux, I began to receive mail from many hams, most of whom were using Linux for various reasons and applications.

I am oriented toward using my shack computer for digital communications such as PSK31, MFSK, etc. Many hams are satisfied to do their logging and may have a QSL program and, of course, connect to the Internet. It matters little what operating system you use — there is a proportion of interest that demonstrates we all do not think alike even though we are involved in the same hobby.

You may be proficient already with the Linux operating system, or you may be sitting on the outside looking in as most of us have been. I have to admit, it is a challenge to break away from the Windows™ standard.

The truth is, Windows is way out in front in numbers of users, and if “everyone is doing it,” then the programmers write for the biggest group of users. I, by virtue of writing this column for so long, have acquired nearly every piece of ham software available, whether it be freeware, shareware, or commercial, most of it of the Windows persuasion. Plus, in order to put together what you see here every month, I have a sizable collection of what you might call officeware.

This Windows 98se-based system that I use has evolved to near bulletproof status as computer systems might be termed. I have all the Microsoft updates installed and a few tools from the “outside” that help keep the computer functional.

So why change?

Okay, to be perfectly honest, I am not really throwing the Windows machine out in the trash barrel. Nobody that I know of does that kind of rash action. I liken keeping the Windows system running much the same as “keeping my day job.” But it is

tempting, once I get to looking at what is up and running with the Linux desktop installation.

In Fig. 1, you see the KPSK software which does just what its name implies. It transmits and receives PSK31, and it does it intuitively as well as dependably. It is a well written, sophisticated piece of freeware for the use of hams.

While I was discovering the KPSK (and there are other ham software programs available), I was exposed to many other interesting and informative aspects of the Linux operating system. Of great interest is the fact that, if you are highly proficient with Linux, it is possible to obtain and set up a highly sophisticated office environment with no, or at least very minimal, investment. What I am saying is that the operating system and just about all the software you might ever need can be obtained free, and the really good part is that it's legal.

Free? ... Really?

All right— Before I turn this column into a forum to promote Linux, let me explain the position here. I have written a few pages worth of good information and placed it on the Web site. When the Web site comes up, click on the “Linux Project” button and you will get a brief summary of my experiences, including what I have found that worked for me in this particular situation, along with a number of things that did not work.

Although some of what I write today will include intricacies involved in getting a program to install and work for you under Linux, I am going to refer you to my Web site for more about the Linux adventure. Plus you will find links to ham Linux software and info you may find useful to help

in getting started in Linux with fewer headaches than I experienced.

KPSK — today's hot topic

There was, in the beginning, only one reason I wanted to get Linux going, and that was to have the ability to review ham software under the Linux system. It became a challenge and, as one ham remarked, I was getting a great education every time I overcame one of the hurdles along the way.

All that aside, I found there are several digital modes supported. I picked a good program to start with and there are several reasons for that statement. The most obvious is the fact that KPSK is a terrific program and when the time to put it on the air finally arrived, I found it a real pleasure to operate.

I first downloaded the program when I was experimenting with the little \$200 computer that came loaded with the Lindows operating system. I was not very adept at using that machine as it arrived on my doorstep. It did what it was purported to do and that was go to the Lindows Web site and easily download and install some of the specially prepared software available to run under the Linux system.

That part worked very slick, though I soon found it was quite limited unless I forked over some more bucks. Ignoring the plea for funding, I decided to try my hand at installing the KPSK in the system. This couldn't be too hard? I was to learn differently, and quickly.

Though Lindows appears to be a regular Linux operating system complete with a KDE graphical user interface (GUI), there was no way it was going to allow installation of a source code package such as KPSK. One main missing ingredient was a

compiler. Then I began to learn ... and learn ... and learn. Fortunately, I found hams to lend a hand (Linux-using hams, of course).

As you can find on my Web site, the final combination for success was the installation of Red Hat 8. I am sure there are other combinations that offer success in other situations, but this does the trick at this shack with the aforementioned hardware.

Word of caution

The mention I made of a compiler is an absolute essential for the installation the way I approached it. So, when you are getting your Linux system installed, make sure you install anything referred to as a "development tool." That is how the compilers get installed.

You will find most of these Linux distribution disks have a "normal" recommended installation. Tell it you want something usually referred to as "custom." Take your time, go through each category and, if you have sufficient hard drive space, install anything that sounds useful in addition to the development tools. I was pleasantly surprised how many useful "packages" are available that do the same things as many of the expensive Windows titles I am used to using.

Before I go too far, you are soon going to find a need for an Internet connection with your Linux computer. There are several reasons you need the Internet connection. One is, of course, to download software. The other is to have access to answers to your computer problems on the same computer where the problems exist.

My first few transfers of the downloaded KPSK program was via floppy disk before installing a permanent working modem. Not bad, because you will find the program is compact, easily fitting on a floppy.

Here is where one of the advantages of the Red Hat 8 made itself known. (And I am led to understand the Mandrake distribution is at least as friendly.) The floppy worked the way we have become accustomed to floppy drives working in the Windows system. Well, almost. In regular Linux, there is a procedure called "mount" whereby many of the "common, everyday" peripherals we are used to using have to be mounted and the disk has to be mounted as well, before Linux will converse with them.

Red Hat 8 seems to overcome that language barrier almost automatically, allowing us to move files in and out of our new (to many of us) Linux system. I could see this was very necessary as I was looking forward to getting screenshots out of the Linux machine for the world to observe.

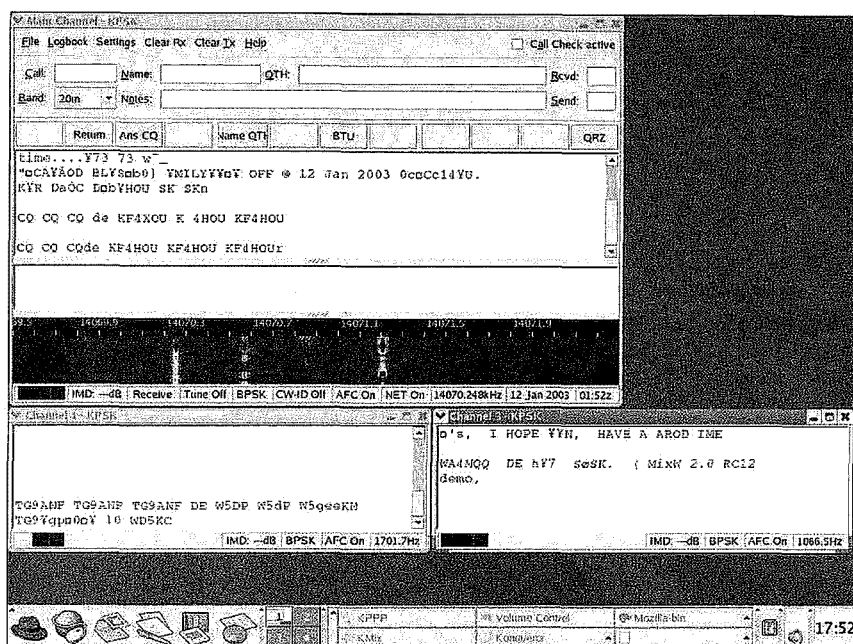


Fig. 1. KPSK screen #1 — The KPSK ver. 1.0 running under Linux is a highly intuitive as well as responsive piece of software. I decided to take this shot with no QSO in progress so I could concentrate on getting three signals decoding simultaneously. In practice, it resembles many of its Windows cousins. It is certainly as easy to use. It comes complete with its own mini-log (see text). You can develop any color scheme you wish in the waterfall as well as use of fonts and colors in the text boxes. The macros are easily written following straightforward instructions in the KPSK docs. You will use the little Call Check box in the upper right often as it grabs anything after "de" in the receive pane. That means you want it off when you transmit and your call is found in that pane. Simple to get used to. The main receive pane is tuned with a left mouse click, and the little auxiliary windows pop up on a right clicked trace. You can fine-tune any of the receive traces by simply activating (clicking on) the corresponding receive pane, then CTRL+ (left or right) Arrow. Slick. You will find shortcuts for such things as saving QSO to log by using the pull-down menus. I left the Red Hat task bar intact in this shot so you might get a glimpse of some not-too-foreign territory. A little reminiscent of Windows stuff. They try to make the Linux GUI not too much of a stretch for us slaves to that other platform.

Incidentally, the folks who have been making these GUIs for Linux users have not been dragging their feet. I expected the only way I was going to get files from one place to another would be by a series of unfamiliar DOS-like commands. Not so. Very early on, I discovered drag-and-drop exists in Red Hat and KDE (whew!). Didn't have to waste a lot of time with basics on my way to fun with hamware.

Install KPSK

Back to the KPSK install. The first thing necessary when you are ready to install the KPSK-1.0.tar.bz2 file (this is the one for KDE3) is to place it in your "Home" directory. All good things result from a good start. You will need to familiarize yourself with the file system in your Linux installation. In a lot of ways, it will remind you of the file tree in your Windows machine. And again, the GUI allows mouse-work to

maneuver through the tree. In the end, after this is installed correctly, your KPSK executable file will be in a subdirectory under your Home directory, and this keeps things in order.

If you are using KDE3 (stands for Konqueror Desk Environment) and have the downloaded file listed above, and have it placed as directed in your Home directory, you are ready to begin the process.

Now, you may have noticed the "if" statements above. Most Linux instructions contain many phrases starting with the words "if you have" because there are a lot of variations (variations, as in what you may have already installed, or have yet to install/replace; and "they" aren't done with the changes by a long reach).

I found several helps upon my entrance into this relatively foreign computer land. One of the best, in the beginning, was the documentation for the KPSK software

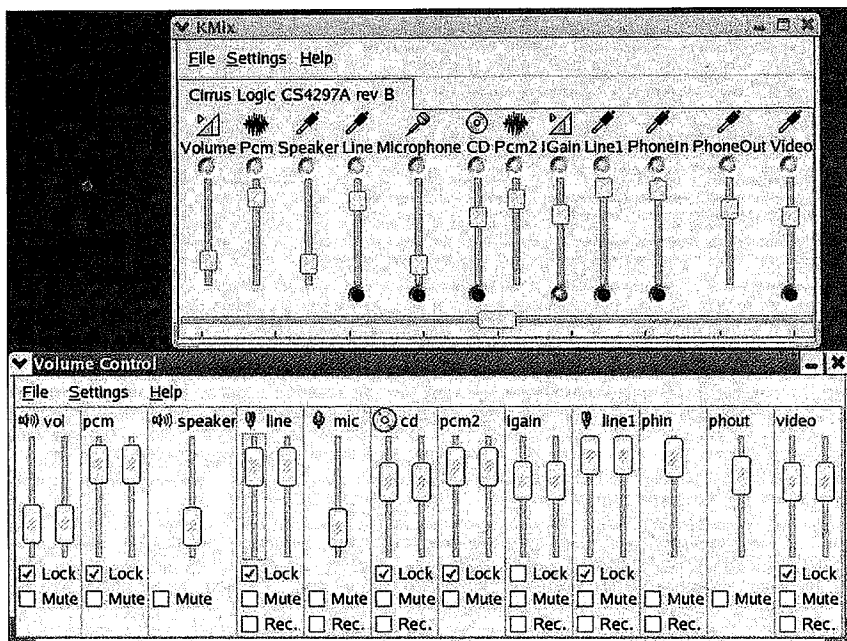


Fig. 2. KDE controls — screen #2. These are definitely more complex and differ from what we are used to in Windows control panels. But they work well. I found the volume control, which is my preferred method of setting zero ALC, very easy to zero in. I think my system is a bit lethargic in response time and found I was experimentally clicking on the various mixer controls in the “KMix” panel to determine which one had me receiving on the correct channel. It seemed to turn out that the I-gain control is correct. Either panel requires a bit of hunting and clicking due to a lack of readily available info, but it really is slick once you get the hang of it. It may look overly complex, but I think the idea is: the needs of the music lovers have been answered better here in two panels than with what takes many panels in Windows applications. And it answers my ham needs perfectly.

found on the first page you come to on the Web when you go to download KPSK. I downloaded and printed that and found it indispensable during installation and setup. You will soon find you have questions. I did, and I have many printed pages of E-mails in a three-ring binder that kept me going.

So, here are a few variations. If you are using a version of KDE2, you will want to download KPSK-0.9.3.tar.gz or possibly one of the earlier versions available on the download site. I was told that if I must use one of the earlier versions, the 0.9.3 worked best. You still place the file in your Home directory but the command to unarchive the files is different according to the extenders on the end of the file names.

As with all else in Linux, I found lots of instructions on this business of unpacking these files, but the following commands worked for me. I found I could enter them by using the Window dropdown menu in Konqueror and clicking “Show Terminal Emulator.” This placed a small window below the Konqueror display and I was able to observe everything going on from one view.

Type into the Terminal Emulator the command `jxvf kpsk-1.0.tar.bz2` (and hit Enter), if you are going to install version 1.0 into the KDE3 system. Or, if you are going to install one of the earlier versions such as 0.9.3 into the KDE2, then type `tar xzvf kpsk-0.9.3.tar.gz` (Enter). (Note: the italicized file names are for example. Use the file name of the file you are unpacking. The extender of the packed file determines the correct “unpack” command.)

If these operations are successful, you will find they take a fair amount of time to complete, as in several minutes. It is a big process and even with the 800 MHz CPU and the meager, but still large, 128M RAM and considerable swap area it is time consuming. If it ends too quickly, you can scroll back through the command lines of the unpacking process and find errors listed. In my case, on early attempts the compiler was missing and it stopped after not finding a “cc” or some variation of that tool.

I mentioned possibly using the earlier KDE2 that I had available under another installation of Red Hat 7.2 and this worked for me up to a point. That point was when I

decided the sound chip was not going to cooperate with the KPSK no matter how I attempted to configure with this RH 7.2 and the KDE2. This could possibly have been solved by a regular Linux guru, but I went on to a better (or simply happier?) clime.

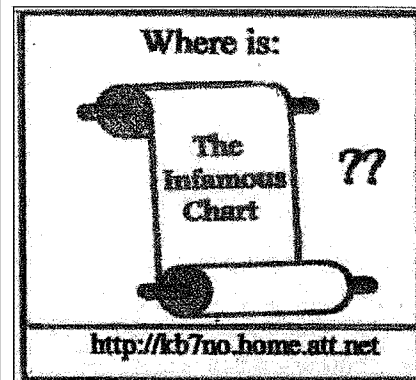
The advantages of the subsequent RH 8 installation were enough so that I started to breathe normally again. Things almost worked like they were supposed to. You will find in the Install and Readme files instructions about running the “Make” command and then the “make install” command. This latter process only works if you login as “Root.”

Now, there was one more thing that was not working. I was having a problem with the soundcard. The soundcard would pass all the tests I could find except I could not decode received PSK signals. Then I read (all else failed) the documentation and found listed there that KPSK would not perform properly with the very soundchip (VIA VT82C686 AC97) installed on this motherboard.

This seemed like a simple thing to fix. I went down to the local store and got a new SoundBlaster SB16 card and installed it. Now I was ready. Well, not quite. Red Hat recognized this fine little plug ‘n’ play card except that it called it an Ensoniq, which was a little upsetting until I learned that was the correct ID in this international manufacturing community. Then all I had to do was find what the different method this version of Red Hat had for configuring the soundcard, bring up the Kmix mixer panel plus the volume control panel (see Fig. 2) and I was off to the races.

One of the neat little built-in bonuses with KPSK is a mini-log system. This system is quite limited, but allows you to keep track of your QSOs adequately. I say it is limited in that the log file does not lend itself to export. I think I have located a Linux-based

Continued on page 58



Some Good News from Space

How many satellites can you keep up with? How many can you work in a day? These have become real questions. Since AMSAT- OSCAR-7 was launched in 1974 (still on the air), we have had dozens of new OSCARS (Orbiting Satellite Carrying Amateur Radio) launched into orbit. There have also been quite a few RS (Russian Radio Sport) and other satellites. In December 2002 we got two more, AATiS-OSCAR-49 and Saudi-OSCAR-50.

The third launch of a converted Soviet SS-18 intercontinental ballistic missile (ICBM) under the joint Russian and Ukrainian DNEPR program took place on December 22, 2002. Six satellites were delivered to a 650 km (400 miles) circular orbit with a 65-degree inclination. They included UniSat-2 from the University of Rome, Italy; Rubin-2 (AO-49) from the OHB-System of Bremen, Germany; SaudiSat-1C (SO-50) from the Institute of Space Research in Riyadh, Saudi Arabia; LatinSat-A and LatinSat-B from the Aprize Satellite of Fairfax, Virginia; and a dummy satellite, built in the Ukraine, in place of the future Trailblazer Lunar spacecraft to be launched on a later flight.

The first-ever DNEPR launch occurred on April 21, 1999, and carried UoSAT-12 from Surrey Satellite Technologies, Ltd. of England. The second launch was on September 26, 2000. This flight carried SaudiSat-1A (SO-41), SaudiSat-1B (SO-42), TungSat-1 (MO-46) from ATSB in Malaysia, and two other nonham satellites. The DNEPRs are doing a great job of taking hamsats into space.

The use of SS-18 ICBMs for satellite launches has proven to be an excellent use for missiles that would otherwise be scrapped or used for military purposes. The SS-18 is the world's largest ICBM and has proven very reliable over the last 20 years. The basic missile is ten feet in diameter and over 100 feet tall, and weighs 211 tons. These liquid-fueled rockets, even after modifications for orbital flights, are launched from silos at the Baikonur Cosmodrome in Kazakhstan, and can carry up to 3.7 metric tons to orbits from 300 to 800 km in altitude.

AO-49

This satellite seems to have many names. Hams now call it simply AO-49 or AATiS-OSCAR-49. AATiS is a German acronym for Arbeitskreis Amateurfunk und Telekommunikation in der Schule which means workinggroup for amateur radio and telecommunications in schools. To the rest of the world, the satellite is called RUBIN-2 from the Fuchs Group (OHB-System, OHB Teledata, Carlo Gavazzi Space and Orbcomm Germany). RUBIN-2 carries several experiments for technology tests and communications experiments.

The ham radio portion, built by the German ham group AATiS, is called SAFIR-M (SATellite For Information Relay). It was developed in close cooperation with the University of Applied Sciences in Pforzheim, Germany. Henning Rech DF9IC led the team. SAFIR-M is a store-and-forward digital system with optional voice beacon capability. The digital downlink is on 145.825 MHz FM packet at 9600 baud. The optional voice beacon also uses this frequency. The uplink is also FM packet, but is on 435.275 MHz at 1200 baud. The system callsign is DPØAIS. Many hams have been involved with AO-49 by downloading and decoding the telemetry, and participating in communications experiments as announced by the AATiS group. For now, just call it AO-49 and start monitoring.

SO-50

SaudiSat-1C, now Saudi-OSCAR-50, is the latest experimental, nonmilitary, satellite built by a team of Saudi scientists

at the Institute of Space Research at the Riyadh-based King Abdul Aziz City for Science and Technology in Saudi Arabia. The satellite program is supervised by Prince Turki ibn Saud ibn Mohammed. The primary mission of the satellite is to provide satellite imagery and data to provide remote sensing capabilities. These images from space are vital to research in agriculture, geography, cartography and natural disaster studies. Due to the small satellite successes of the SaudiSats, Saudi Arabia has

Continued on page 58

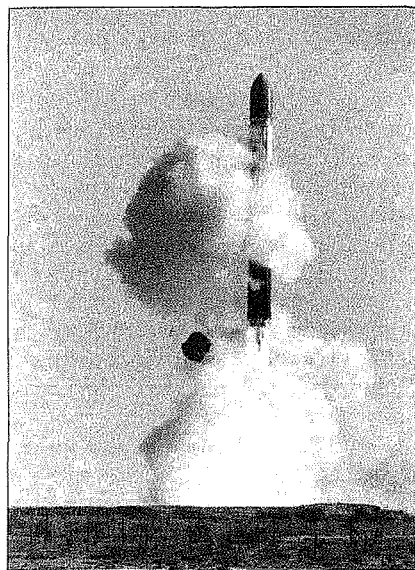


Photo A. The launch of the third converted SS-18 ICBM, under the joint Russian and Ukrainian DNEPR program, put AO-49 and SO-50 successfully into orbit from a missile silo in Kazakhstan.

Where Can I Find ...?

"Wow! Where in the world did you ever find that?" These are the words that make any ham proud of his new gadget. If you're new to amateur radio, you may not know where hams go to find the treasures that make the hobby so much fun.

Obviously, there is not a lot of ham radio equipment available at the local mall or Wal-Mart, but there are quite a few places you can go to find those things that make the hobby possible. Some are pretty obvious, while others are more obscure. Naturally there are advantages and disadvantages to each. For those of you who are new to the hobby, here are some of the places where you may want to invest a little time.

The first, and perhaps most obvious choice is the ham radio equipment dealer. If you live near a dealer, you have some distinct advantages over those who do not. A dealer offers a chance to actually look at and sometimes try out various types of equipment. After all, radios are not merely their technical specifications — the feel of the radio is a major contributor to how much you will like it. At a dealer, you will be able to check out and compare the features on various models from different manufacturers to see which best fits your individual operating style. Maybe computer control is essential, or perhaps it is the quality of the digital signal processor. Are the controls easy to read? As most of us get older this becomes a more critical requirement. I was taught long ago that "if you can't hear 'em, you can't work 'em." By the same token, if I can't read the control panel, I can't work them either!

The main advantage dealers offer is service. If you need expert advice, you probably will find it at a dealer. Need an optional component installed or have a technical problem? The service department at the dealer's will be there to support you. If you are moving up to a more advanced radio, the dealer will be the one who can offer you a trade-in on your old rig (if you can bear to part with it). Don't have the cash in your pocket? Most

dealers will happily process your credit card. A dealer can make a purchase as easy as necessary for you to leave the store with a carload of goodies. On the other hand, you may pay more for a particular item at a dealer, but providing service and maintaining inventory has a cost, and this value that the dealer has added may make the transaction much more beneficial to you.

The second choice is the local hamfest. Many amateur radio clubs host an annual event that provides a forum for the buying and selling of ham radio and other miscellaneous and sundry products. Someone cleaning out their shack may part with items at a fraction of their original price, and it could include just what you're looking for. While you may make a great deal, you may also walk for miles through the vendor area and not see anything you have on your list. Or, you may find something you never knew existed, and certainly never knew you needed, and happily take off in a new direction in the hobby.

Hamfests offer many other features. Usually there will be the opportunity to take the test for your license upgrade. You can stock up on SkyWarn or ARRL decals or get a name pin or ball cap with your callsign. It's also a great chance to meet those folks you talk with on the local repeater and see what they actually look like. You may be surprised that they don't look like what you expected — but then they will be equally surprised with you. If you don't live near a dealer, a hamfest may be your chance to see their offerings, as many dealers set up large booths at some hamfests. Usually they will have new, in-the-box products representing some of their most popular sellers. And, of course, there will be the ever popular credit card machine hooked up to a cell phone to ensure that you can quickly and easily take possession of your new equipment.

When I lived in Ohio, I could spend a fair number of weekends over the year at various hamfests. Now that I am in a more rural area, I don't expect to have as much opportunity to participate in the hamfest hunt. That is one of the downsides of hamfests — you have to be within a reasonable distance to enjoy one. One of the other downsides is that with the exceptions of dealers, most purchases are cash only and all sales are final. Nothing is perfect, but they sure are fun.

The local ham club offers a couple of other options for finding the perfect piece of radio gear. Many ham clubs offer tailgate parties on some weekends or in conjunction with their regular club meetings. Club members bring their offerings in the trunks of their cars or the backs of the SUVs, park in a designated area and have a mini-hamfest. Clubs also offer classified ads in their newsletters to help members buy and sell gear and many have on-the-air swap meets, usually on the local repeater. It has long been determined that items specifically aimed at amateur radio can be offered on the air. Even so, some clubs may impose the rule that prices are not to be discussed over the air.

With the World Wide Web, there are many additional opportunities available. Most dealers have Web pages that include their entire catalog, product data sheets, and brochures. You can also see what used, demo and consignment equipment is available. Naturally, you can place an order at the Web site with your handy-dandy credit card over a secure Internet link.

Many ham clubs have Web pages with swap and shop offerings, and there are often links to other clubs or other ham sites.

Continued on page 59

Two New Tools for T-Hunting

As the snow melts and the days warm up, it's time to plan for another season of hidden transmitter hunting, both in cars and on foot. This month, "Homing In" looks at two new items for your radio direction finding (RDF) arsenal and invites you to Ohio for USA's biggest foxhunt of the year.

My local ham radio store doesn't carry MRDF equipment. Yours probably doesn't, either. Maybe they all will someday, but for now, most foxhunting fans are building their own gear or ordering it by mail. Just becoming available are two items worth a close look.

New loop from Arrow

Al Lowe NØIMW, proprietor of Arrow Antennas,¹ has been interested in providing

equipment to foxhunters since he started his company. In previous years he has introduced some RDF-related products, including an offset attenuator and a yagi with adjustable element lengths and spacing to cover a wide frequency range. They were good products, but never caught on. Perhaps they were ahead of their time or just needed more advertising.

Arrow's current line of yagis appeals to a larger ham market, including backpackers and others who need lightweight portable

beams. The aluminum arrow shaft material in the elements makes them about half the weight of comparable yagis made from tubular aluminum. They're so much easier to carry in the field that the 146-3 two-element yagi, which weighs less than one pound, has become a favorite among some T-hunters for sniffing on foot at the end of the hunt.

The 440-3 model for 70 centimeters has only a 16-inch boom and is great for sniffing foxes on that band or tracking the third harmonic of two-meter signals. There's even an Arrow yagi with elements for both bands, the 146/437-10. With dual

feedlines, it's intended for satellite users but some hams like it for sniffing on the fundamental and third harmonic of two meters. If you need a beam for an "odd" frequency range, such as 172-173 MHz for the Saskatchewan Burrowing Owl monitoring project,² Arrow will make a custom 3-element yagi for you at a reasonable price.

Arrow's new loop antenna (Model FHL for \$59) is based on a proven design for the VHF aircraft band. Al came up with an improved method of construction, making it more rugged and insuring uniformity from loop to loop. It's not a resonant loop, so no tuning is needed. Non-resonant loops are less efficient, but they are directional over a very wide frequency range. This one should work anywhere between 40 and 215 MHz. I have checked it at several frequencies throughout that range with the setup in **Photo A**, and I obtained good directional nulls when I had an unobstructed path to the source.

Nulls? That's right. You get best bearings with small loops by using the minimum-signal pattern points, which are in the directions "through the loop." By "small" loops, I mean always less than one-third wavelength in circumference, and typically less than 0.1 wavelength. Because of its size and electrostatic shield, the Arrow loop behaves more like a coil than a wire antenna.

Just as with the rod antenna in your transistor AM radio, there are two directional nulls, 180 degrees apart. Nulls are much sharper than the broad peaks off the side. You'll have to figure out which of the two nulls is the right one. Sometimes it's easy (when you know the FM broadcast station you're seeking is on a hill, for instance). At other times, it's not. Parasitic elements like directors and reflectors aren't suitable for fractional-wavelength loop antennas like



Photo A. Here's a way to get bearing lines over a wide range of VHF frequencies. Use the Arrow FHL loop, connected through a home-built offset attenuator to a wide-range receiver such as the Icom IC-R10. This loop is only available with a BNC type connector. (Photo by Joe Moell KØOV)

this. Shielding methods such as screens and metal plates won't make them unidirectional either.

Loops are not "high performance" antennas for VHF/UHF RDF because of their bidirectional nulls and reduced sensitivity as compared to beams. Signal reflections arriving at right angles to the direct signal will "fill in" the nulls, making it difficult or impossible to get useful bearings when they are present. But for special situations, such as the hunt for strong interference on a frequency for which you don't have a beam, a loop can do the job, and it's easy to carry in the "bag of tricks." For best results, take loop bearings in clear areas, away from your vehicle, other large metal objects and long wires. It's hard to tell the exact line of bearing by peering through the loop, so I recommend attaching a short non-metallic sighting stick, carefully oriented at right angles to the plane of the loop.

Since nulls become hard to detect when the signal gets very strong, you'll need an RF attenuator to pinpoint the signal source. Arrow Antennas sells a resistive attenuator with toggle switches, which is fine for mobile hunting with a beam. However, it's not suitable for use with a hand-held receiver, because strong signals enter directly through the case. The solution is to use an offset attenuator, which shifts a controllable fraction of the signal to another frequency. You can build one at home for about fifteen dollars. Offset attenuator plans and kit information are at the "Homing In" Web site.

Best Aussie sniffer ever

A handie-talkie with S-meter and an offset attenuator are all you need to get bearings and find foxes on two meters with your directional antenna. You can win some local hunts that way, but as you advance as an international-rules competitor, you'll appreciate special ARDF receiver sets with features to make you more efficient, such as a tone-pitch signal-strength indicator. I have described sets of this type by hams from Canada, Ukraine, Russia, and Australia over the years.

Of them all, the Aussies have been the first to incorporate the very latest receiver components and technologies. In 1999, Bryan Ackerly VK3YNG brought his unique microcontroller-powered receiver to the First IARU Region 2 ARDF Championships in Portland, Oregon (**Photo B**). Everyone was impressed, but his set was still experimental, not ready for production. Now the latest version, called Sniffer 4, is fully tested and available (**Photo C**). Sniffer 4 was

designed by foxhunters for foxhunters, and it shows.

Bryan's set doesn't receive DC to daylight like many HTs, but it covers 10 MHz in two chunks that include the full American two-meter band and the VHF aircraft band. Who will be the first to use it to find a wayward Emergency Locator Transmitter (ELT)? Frequencies are entered in the usual 4-digit way, so punching in "F6565" sets it to the USA T-hunting frequency of 146.565 MHz and "F2150" brings up the 121.5 MHz aircraft ELT frequency. A touch of the mode button changes the output between AM and FM reception on either band.

Australian foxhunters like tone-pitch signal strength indicators. They call it the whoopee mode because of the "wheeee-ooop" sound they make as the beam is swept across an incoming signal. Sniffer 4 has a high-sensitivity whoopee response, insuring the most accurate bearings possible for your directional antenna. You can use it with a yagi, quad, phased array, or even the Arrow loop.

The automatic attenuation feature requires a bit of self-training, but it's worth it. As you approach the fox and the signal gets stronger, Sniffer 4 automatically increases the input RF attenuation in range steps of about 15 dB each and beeps to tell you when a range change takes place. The single-digit indicator normally displays the current attenuation range. When the signal goes off-air, attenuation drops out in two seconds (which you can change between 1 and 5 seconds). This keeps you from missing a weak transmitter that might also be part of the hunt.

It may be hard to get used to not manually dialing in attenuation, but this never-miss-a-weak-T feature makes it worth trying. If you insist, you can disable the automatic ranging and step the attenuation by pushing a button. The



Photo B. Contact this chap if you want a Sniffer 4. He's Bryan Ackerly VK3YNG, shown here treating an ankle injury he got on the two-meter hunt at the IARU Region 2 ARDF Championships in Portland, Oregon, back in 1999. (Photo by Joe Moell KØOV)



Photo C. Sniffer 4 is built into a rugged epoxy case with a membrane keypad to make it relatively impervious to rain. But you have to take out four screws to change the batteries. (Photo by Joe Moell KØOV)

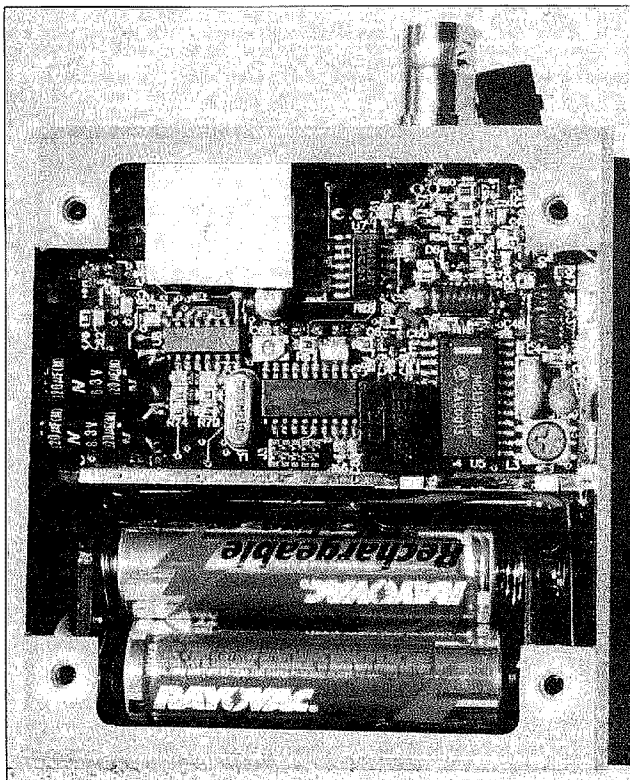


Photo D. Inside, Sniffer 4 is a rugged assembly of surface-mount parts. I'm glad I didn't have to build it! (Photo by Joe Moell KØOV)

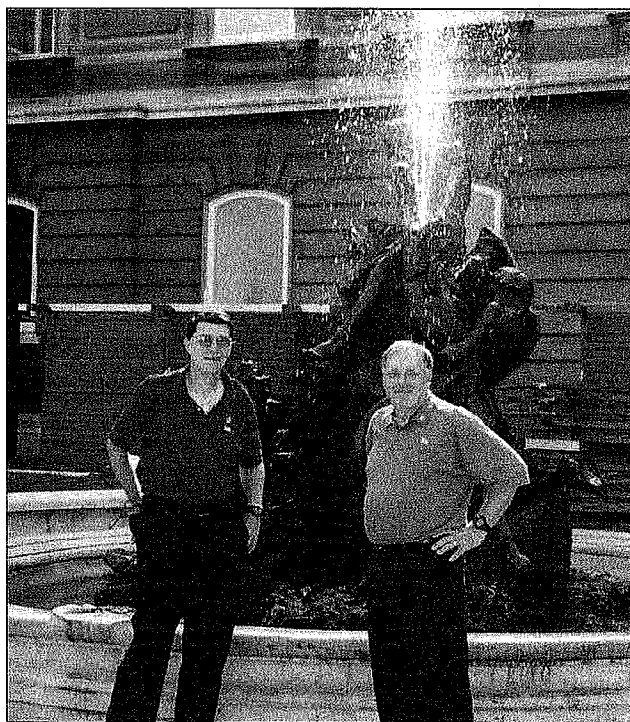


Photo E. Bob Frey WA6EZV (left) and Dick Arnett WB4SUV are co-chairs of the Third USA ARDF Championships, beginning July 30 near Cincinnati. They were also co-captains of Team USA at the 2002 ARDF World Championships in Slovakia. This snapshot is from that trip. (Photo by Bob Frey WA6EZV)

display digit is plenty bright in sunlight, and a sensor activates a reduced brightness mode for night hunts.

The term "sniffer" implies a receiver with reduced sensitivity and selectivity, intended primarily for closing in on strong signals. But in my tests, the audio strength indicator would easily detect a 2 microvolt signal on two meters. That's not quite as sensitive as most handie-talkies, but it's good enough to hear all the foxes on an international course when used with a 3-element beam. At the other end, a 100 millivolt signal (maximum output of my bench RF generator) only registered in the "5" range on the 9-step attenuator. So there should be no problem sniffing out high-power transmitters.

Even if you already have a complete mobile RDF setup, Sniffer 4 can add to it as a dedicated "You are here!" radio. Put it on the dash with a rubber ducky antenna and it will give you a running idea of how close you're getting. That's especially helpful if you hunt only with a Doppler set.

When you're listening to whoopee signal strength in the speaker, you can't hear the signal modulation. Depending on the hunt, you may not be able to tell which transmitter in a multi-T hunt is on the air. So Sniffer 4 supports stereo headphones. In one ear, you get whoopee tone, and in the other, signal audio. There are six frequency memories, enough for most hunts since you don't have to store extra frequencies for offset attenuation.

Two AA alkaline batteries will power Sniffer 4 for about three hours, depending on volume, indicator brightness, and whether you wear headphones. That's enough for an international-rules hunt. If you're willing to spend more, lithium batteries will keep it going for about 14 hours. I'm experimenting with Rayovac rechargeable alkaline batteries,³ charging them up promptly after every hunt. A pair of nickel-cadmium (Ni-Cd) or nickel metal hydride (Ni-MH) batteries in the supplied holder won't do, because their terminal voltages are too low.

Another option would be three cells in series, either alkaline, Ni-Cd, or Ni-MH. Sniffer 4 will operate at up to 5 volts, so this would give more "headroom" for voltage drop as batteries discharge. But there's not enough room for three AA-size cells inside — you would have to modify the unit for external DC power (**Photo D**). An indicator tells you when the batteries are getting low. If you forget and leave the unit on, it will shut itself off after ten minutes of inactivity, meaning no button pressed and no attenuation change.

But wait, there's more! Like most microprocessor-controlled radios, there are bells and whistles for advanced users, such as a memory to tell you the maximum attenuation value achieved since last frequency change or power-up. There's also a 0-to-99% battery-remaining indicator, automatic volume reduction when the battery gets low, and a low-tone whoopee option for persons with poor high-frequency hearing. For Scouts and other beginners, there is a reduced-functionality mode that simplifies operation.

Best of all for 5-fox international competitions is a built-in timer. Synchronize it to the start of fox #1 and it will beep a warning ten seconds before the end of each fox's transmission, then beep out the number of the next fox to transmit. At switchover time, it immediately resets the attenuation to minimum so you are ready if the next fox is weak.

At the last southern California radio-orienting practice session, I was one of four foxhunters who took Sniffer 4 sets on the 4-kilometer six-fox course. All of us were impressed with the features and performance. There were only two minor problems: The timer lost track of fox numbers because there were six of them, so we just ignored the number indications. Also a practice transmitter on

146.76 MHz caused QRM to the 146.565 MHz signals when it was within about 100 yards.

Sniffer 4 is a great example of gear that's designed by the innovative people who will be using it. As I write, it's available for a little over 200 US dollars, shipped directly from Ferntree Gully. With it comes a mini-CD containing the instruction manual and schematic in PDF form. The manual is also available for download on the Web.⁴

Cincinnati hosts the world

A great opportunity to use your sniffing gear, whatever type you prefer, is coming this summer. Start practicing now for the Third USA ARDF Championships, July 30th to August 3rd, near Cincinnati, Ohio. Medals are awaiting the best radio-orientees in nine age/gender categories, from 19-and-under to 60-and-older.

You may have passed through Cincinnati on your way to Dayton, but you may not have realized that it's a hotbed of foxhunting activity. Monthly mobile T-hunts have taken place in all four seasons for over 15 years, usually bounded by the Interstate 275 loop that includes about six hundred square miles of Ohio, Kentucky, and Indiana. Hence the club name: OH-KY-IN Amateur Radio Society. The club also holds on-foot hunts at picnics, hamfests, and Scout events.

More recently, these Cincinnati hams have developed their skills at radio-orienteeing under international rules. Three of them competed at the Second USA Championships last year in Pine Mountain, Georgia.⁵ Not only did they bring home four medals, they paid careful attention to how the events were organized and administered, so they can do just as good a job this summer.

As usual for a fully hosted multi-nation ARDF event, the USA Championships will get under way with a training day. Practice foxes will transmit on both 80 meters and two meters at Miami University in Oxford, Ohio. Next day, the competitors will be transported to a previously undisclosed location for the two-meter hunt. They will be given their orienteeing maps and individually timed as they set out on the course. The five foxes transmit for 60 seconds each in rotating sequence, sending an easy-to-recognize identification as explained many times previously in this column.

Winners will be the ones who find the most fox transmitters and navigate to the finish line in the least time. Besides their

maps, they will have a fox transmitter on a separate frequency to home in on at the end. Next day will bring a similar event in a different place with foxes on the 80-meter band. OH-KY-IN isn't giving any clues about course length, but typically it's 4 to 8 kilometers direct from the start to each fox in the shortest sequence and then to the finish. Your mileage may vary, as they say, depending on your RDF skills.

The International Amateur Radio Union (IARU) has designated this event as the Second IARU Region 2 ARDF Championships, which means that individual foxhunters are invited from all countries with IARU member societies. Despite the present uncertainties of international air travel, OH-KY-IN members are hoping to welcome visitors from both Europe and Asia, in addition to Canada and the USA. Last year, 14 states were represented at Pine Mountain — it would be great to have even more this year.

OH-KY-IN ARS co-chairs overseeing the plans are Bob Frey WA6EZV and Dick Arnett WB4SUV (Photo E). Both have a wealth of experience in the sport, having competed at the 2001 and 2002 USA National Championships, the 1999 IARU Region 2 Championships, and the 2000 and 2002 World Championships. Additional support will be provided by the Cincinnati Orienteering Group.

To make it easier for visitors, especially those from abroad, group housing and local transportation will be available. OH-KY-IN ARS has arranged for a block of double-occupancy rooms at Havighurst Hall, a co-ed dormitory at Miami University, close to five buffet dining halls on the campus. Alternately, attendees may arrange their own lodging and meals.

There will be plenty of champions in Cincinnati this summer, but everyone, champ or not, is invited to attend and participate. If you can walk or jog a 10 km race course, you have the stamina to complete an ARDF event. If you achieve good scores on orange orienteeing courses, you are well on your way to becoming a top-tier radio-orientee. All you need is some practice with direction-finding equipment. For that, why not organize the hams in your town to have some on-foot foxhunts. Get started now while there's plenty of time. To make sure you're committed, go to the Cincinnati Championships Web site [www.ardfusa.com] and sign up. Maybe you'll become an international champion!

Registering early will help OH-KY-IN to

plan the best possible events. If you're coming from outside the USA and need help getting a visa, it's important that you register by May 15.

For more RDF equipment suggestions and projects, plus the latest news of mobile and on-foot transmitter hunts in the USA, visit the "Homing In" Web site [www.homingin.com]. As always, I welcome your photos and stories of all the transmitter hunts in your area. Send them electronically or via the post to addresses at the beginning of this article.

Next month, it's back to my multipart "Homing In" series on Doppler RDF technology, delving into mobile Doppler antenna sets and the best ways to optimize their performance.

Notes

1. 604 West 17th Street, Cheyenne, WY 82001; (307) 638-2369; [www.arrow-antennas.com].

2. "Homing In: Squegging — Now It Helps Us Track the Birds," *73 Magazine*, January 2003.

3. "Homing In: A Rechargeable Alternative and the Dancing Buzz," *73 Magazine*, March 1999.

4. [www.users.bigpond.net.au/vk3yng/foxhunt/foxhunt.html].

5. "Homing In: Peak Performances in Pine Mountain," *73 Magazine*, July 2002, and "Homing In: USA ARDF Championships in Georgia — Part 2," August 2002. 73

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Conversion of Qualcomm "Lamb Chop" Transceiver Board to a 24192 Signal Marker

I picked up a converted 24 GHz transceiver from Sam K6VLM's (now a silent key) estate. Basic testing showed that the receiver put an increase in noise to the 432 IF system and I assumed it was functioning. Moreover, putting probes from my various power meters near the circular waveguide that normally feeds the dish antenna showed a power output on SSB operation.

For this power test I used an HP-432 power meter and a 478A thermistor power head calibrated to 12.4 GHz. It was both a test to see if the power meter head would respond to 24 GHz RF power and to see if the 24 GHz transceiver was actually transmitting.

I had to go about these routes of endeavor as I had nothing better to verify receiver operation, nor the ability to measure 24 GHz power or frequency. My power meter—calibrated RF thermistors had calibration to 18 GHz using the HP-8478 power meter head and 12.4 GHz for the HP-478 power head. Inasmuch as I only had one 8478 head and several 478 lower frequency heads, I would

gamble with the 478 power meter head and try to sense transmitter power from the 24 GHz transceiver to see if it was operational.

What was to be tried was a direct close position of the "N" connector of the 478 power meter thermistor head and the circular waveguide output of the 24 GHz transmitter. Keying the 24 GHz transmitter and slowly inching toward the circular waveguide, I discovered it was actually working. While not calibrated, it did record a +10 dBm power output and followed SSB voice nicely. Well, now, did we prove the operation of the 24 GHz transceiver that we were trying to verify, or was it all a fool's folly? Without a frequency meter that would respond

to 24 GHz, we could not measure frequency. We could use our spectrum analyzer, but calibration as to frequency was drifty at best. The spectrum analyzer would not show us accuracy to 24192.2 MHz.

We knew from these earlier tests that power was being generated and receiver conversion was taking place by the noise increase in the IF system transceiver. What, then, could be done with a limited test equipment budget?

The actual idea came from my partner, Kerry N6IZW. The idea was to build a fractional harmonic generator to allow receiving the subharmonic frequency source generated by a surplus synthesizer that we readily could confirm to be accurate in frequency—in other words, a frequency marker for the receiving portion of the system.

Taking stock of the surplus Qualcomm synthesizers we have available, it was decided to try to stay as close to the existing frequency scheme as possible. This scheme used a synthesizer at 2620 MHz and a final multiplied LO of 13.1 GHz. Working it out, we found that dividing 24192 by 9 produces a synthesizer frequency of 2688 MHz. We tried converting the synthesizer to 2688 MHz and using the stock multiplier that normally multiplied to 13.1 GHz, and it worked well. Slightly off frequency at 24 GHz by 15 kHz, but a very good marker. This accuracy problem can be taken care of easily by verifying the 10 MHz clock that drives the synthesizer and controls its accuracy. Improvements can be made to the unit by stripline peaking, and adjustments made to increase performance at 24 GHz.

Was it worth it to go through this to prove the operation of a 24 GHz transceiver? I feel it was. It found the problem in the local oscillator system being off frequency, proved the operation of the receiver, and gave a small measure of system performance and sensitivity. While it did not prove the transmitter to be operational on frequency, it did give a measure of confidence of transmitter operation, as the synthesizer that runs the receiver is used for transmit also. Having a test generator in the test bench arsenal has proven to be a valuable asset.

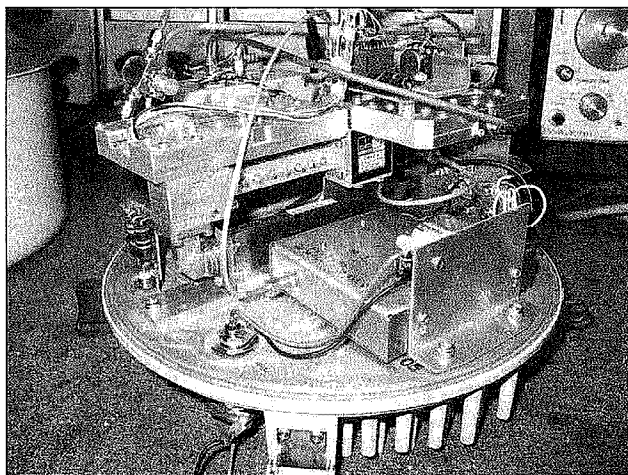


Photo A. Side view of Pecom 24 GHz converter: Waveguide circulators shown with left top transmitter board, right receiver board, and bottom center IF synthesizer at 2640 MHz in aluminum container. Main system controlled by 1/2 frequency LO at 10560 MHz synthesizer. Conversion by Sam K6VLM.

Back to the original testing of the Lamb Chop transceiver boards. I constructed a duplicate frequency marker system to verify my system and found it to be nonfunctional to the calibrated harmonic generator. While testing the system, I found that the PIC processor that loads the program into my Pecom 24 GHz transceiver LO synthesizer was not functioning and the synthesizer was outputting a free-running LO giving me the impression of receiver and transmitter operation — functioning, but far off frequency. Making a long story short, we determined that the PIC processor xtal (4 MHz) was defective and not starting the PIC processor-stored program to run the synthesizer. The system came up and functioned after we replaced the 4 MHz xtal in the PIC processor.

In the scheme of things, using the Lamb Chop board worked well, but it is overkill as it could be used for a 10 GHz transceiver, not just a marker. Other components could be utilized to perform the same function. A standard Qualcomm synthesizer and multiplier board could be used and would make the finished package smaller. These same units have been used for other frequencies and just have not been proven for this frequency of operation as of now. I see no reason that they would not function just as well as the Lamb Chop board described in this article. Following is the actual conversion I performed on the Lamb Chop board to convert it to a 24192 MHz marker.

Conversion of the Lamb Chop PC board

The Lamb Chop board is a complete transceiver intended for operation on Tx of 14 GHz and Rx of 12 GHz. It comes stock with a synthesizer programmed normally to 2620 MHz, which is multiplied 5 times to obtain the system LO of 13.1 GHz. The conversion is quite easy and requires only reprogramming the 3216 synthesizer chip from bus mode to pin-for-pin programming and changing a few pins by cutting them open with an X-acto knife. The new frequency of operation will be 2688 MHz. As this is very near the original operation frequency, no change to the VCO is required. I suggest a pretest prior to modifications, allowing a confidence in the basic board before modification takes place.

To do a pretest of board circuitry to eliminate troubles in conversion later, it is best to do a simple precheck of the operation of the VCO and multiplier. All that is required is a +12 volt supply at a half amp and a 10 MHz TCXO. Connect the +12 volt supply common to the TCXO center pin of three

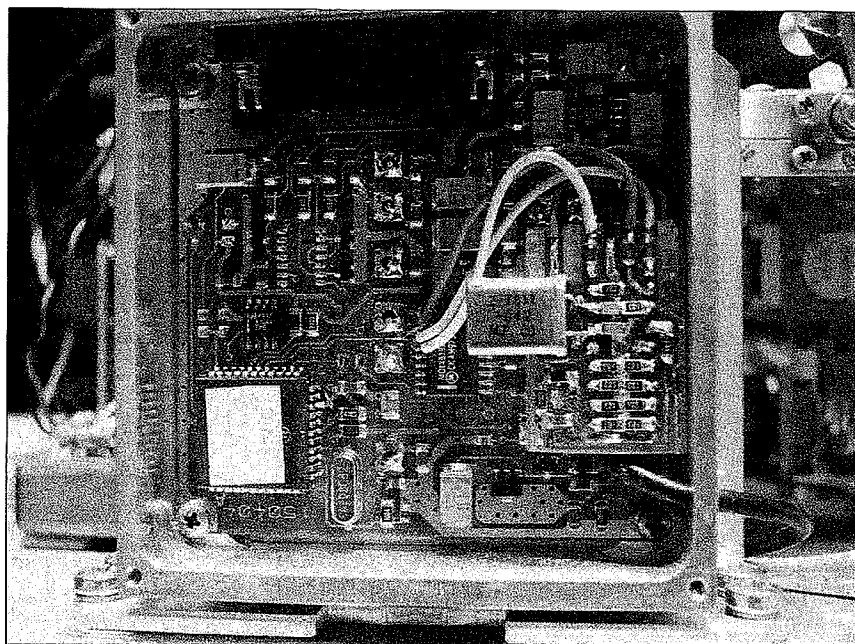


Photo B. Inside of 10560 MHz synthesizer, with PIC processor board added to modify synth for internal PIC processor control. Added new 4 MHz crystal to repair PIC processor for operation.

pins, and the top left coaxial connector solder pad. The top left solder pad is located by holding the Lamb Chop board with the cutout at bottom right.

Position the two solder pads for connections one top left (+12 volt DC) and one right top which is the 10 MHz TCXO drive input. For further confidence, just above the 3216-1 synthesizer chip there is a notch about 1/2 inch wide that allows access to a mounting bolt. Left of this by a half inch is the leftmost DC input contact. To the right about an inch is the 10 MHz input drive

point from the TCXO output pin three of three. Pin two is the DC input, and is the center of the three pins, Pin one is no connection. The TCXO's other two pins are both ground. In the cutout of the Lamb Chop board is a place to use RTV to affix the 10 MHz TCXO to the inside corner or use a small length of PC board material to bolt to the frame and two 4/40 bolts on the bottom of the TCXO. Either is just fine to prevent a dangling TCXO on jumper

Continued on page 56

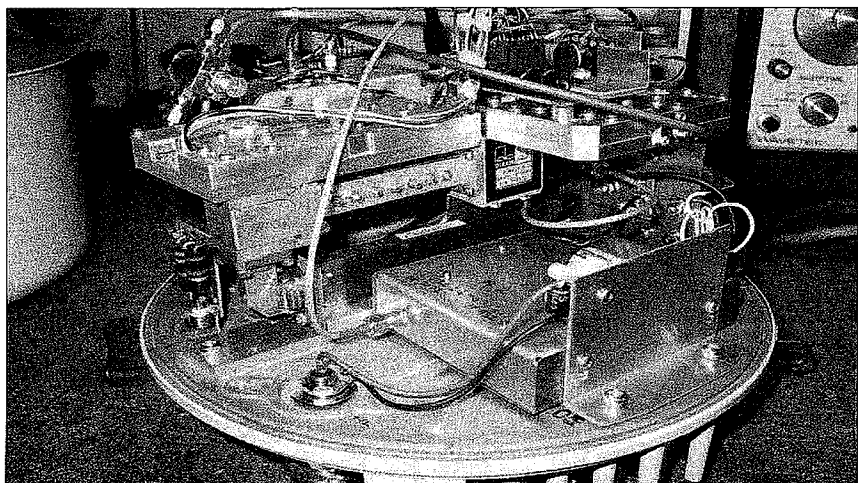


Photo C. Full view of converted Lamb Chop board for 24192 MHz marker frequency from 9th harmonic of synthesizer operating at 2688 MHz. Temporary plastic container houses batteries at 12 volts and cushion material to hold board for harmonic generator till a better one can be obtained. I obtained the plastic container at a 99 cents store.

ABOVE & BEYOND

continued from page 55

wires and coax cable. It dresses up the conversion a bit.

Remove the metal cover plate on the gold board, as it is not required in the conversion. If all is operating as expected, you should see 2620 MHz from the green board below the 3216-I synth chip and 13.1 GHz, the fifth harmonic of the output near the receive mixer circuitry on the gold board. DC current is about 1/2 amp at 12 volts. Once you are satisfied with basic operation, shut off the power and start reprogramming the pin-for-pin conversion.

The programming conversion to be done is as follows. Lift with an X-acto knife pins (4, on top of chip; 7, 8, 9, 10, 13, 14, 15, on side of chip; 19, 20, and 22, on bottom side of chip). Be sure to start counting pin #1 under the small dot above pin #1 which I call top face; side face counts #7 to #17; and bottom face counts from pin #18. Only pins lifted that require a TTL low require grounding — all other pins are left open (HIGH).

Ground can be found on pins #5 and #6, and pin #18. Wire ground starting with main ground pin #5-#6, and route ground connection wire to pins #7, #9, #10, #13, and #14. Connect ground on pin #18 to pin #20.

An open condition and TTL HIGH should be found on pins #8, #15, #19, and #22. This should reprogram your synthesizer for 2688 MHz, which provides the 9th harmonic for 24192 MHz.

Further mods include shorting across the original 13.1 GHz filter and replacing it with a 50 ohm strip line, and peaking the multiplier circuit for best harmonic operation for 24192 MHz. While I do not have a spectrum analyzer to observe output at 24192, I have started to use my 24 GHz receiver's IF system S-meter to show loose coupling output increases. It's not perfect, but produces a good note for SSB operation. It is stable to frequency and requires that the metal cover of the gold board be removed to allow maximum harmonic output to be injected into the ether. With a harmonic generator in the same garage and no direct connection, I was able to receive S7 on my IF transceiver, a Yaesu FT-817 at 432 MHz, on my 24 GHz downconverter some 5 feet away.

Operation is quite easy as with internal batteries that I added to a small plastic food container (obtained at a local 99 cents store), to house the Lamb Chop board, it worked quite well. The food container allowed RF to be radiated for pick up by the 24 GHz

receiver without affecting the synthesizer, and gives it a measure of protection for transportation and usage. The only external control on the plastic food container was a toggle on/off switch. I added an internal fuse holder for battery protection, and during periods of storage I pull the fuse. This allows protection for the charged batteries in case someone accidentally bumps the power switch on.

Well, there it is, this month's test adjunct for a 24 GHz marker test generator. Exact frequency control can be fixed by proper adjustment of the 10 MHz reference crystal oscillator. Specifics are not exact. If you like it as off-exact-frequency, just note where it's at and multiply to 24 GHz by multiplying the synthesizer frequency times 9 for exact frequency at 24 GHz; it's a matter of personal preference.

For references to other technical articles and the 10 GHz transceiver "Lamb Chop" board 10 GHz converter look at [<http://www.ham-radio.com/sbms/sd/>] on the Web. Look under technical papers from the San Diego Microwave Group for a plethora of articles on a full range of subjects from our group's members. This effort is hosted by The San Bernardino Microwave Society, on their Web page base ID at [<http://www.ham-radio.com>]. Take a look at this long-time Microwave Society's newsletters and other points of general interest dedicated to amateur microwave subjects. The material referenced in this article and the technical papers above are available from the AUTHOR to interested parties, for amateur radio use only. Please only contact the author for further information.

Well, that's it for this month's column. As always, I will be glad to answer questions on this and other related material. Please send E-mail to [clhough@pacbell.net], and I will try to give you a reply in a timely manner. 73, Chuck WB6IGP. 73

Ham's Handy Heat Hunter

continued from page 22

Modifications

Instead of a brass tube to house the LM34CZ, a glass vial may be used. Glass (as well as epoxy) is resistant to almost every environmental condition. However, care must be taken that the vial is not exposed to rapidly changing temperatures, as this could fracture the glass. These vials are commonly used to contain perfume samples and are

available at the perfume counter of most department stores.

Solder a three-conductor cable suitable for the probe assemblies environment to the temperature sensor. In order to use a different cable, the temperature sensor's leads are connected to the stereo plug as illustrated in Fig. 2. Fill the glass vial with epoxy, keeping air bubbles to a minimum. Next, insert the sensor into the vial. When the epoxy cures, this sensor can be used in almost any environment.

Now you have a simple way to measure temperature accurately — the Digital Multimeter Temperature Measurement Adapter. 73

Ozzie's Judi-Loop

continued from page 23

loop and ladder line instead of coax, which would make it more efficient for use on the higher bands. It's a quieter antenna and can be used not only on the fundamental frequency it was designed for, but also on its harmonics, providing you didn't use a coax feedline.

I ran a not-so-symmetrical 35-foot loop, weaving it in and out of the rafters, and up and down, in order to get all the wire in. I had the external tuner, but now I wanted to use my built-in automatic tuner. Herein lies the problem: how to feed a balanced line with a transceiver that was designed for 52-ohm coax. First, I decided to wind a ferrite 4:1 balun — and it worked! I was able to tune and load everything from 40 to 10 meters, although I was not pleased with the SWR on some of the higher bands. After looking through a number of articles on how to feed a balanced line, I couldn't find anything that applied to a transceiver antenna tuner.

I decided to try an aircore balun. Not much is said about them in the antenna handbooks, least of all how to use them with a built-in antenna tuner. By using four equal lengths of #14 insulated wire 10 feet long, I wound the balun on a one-inch-outside-diameter piece of tubing I happened to have in my junk box.

Voilà! It worked! My Jupiter loop, or ... the Jupi-Loop! Here are the SWR figures when used with my antenna tuner: 40m — 1.7:1; 30m — 1.0:1; 20m — 1.0:1; 17m — 1.0:1; 15m — 1.0:1; 12m — 1.0:1; 10m — 1.0:1.

Forty meters was the only band that didn't show unity, but it was close enough. I decided I didn't want to trim the antenna, as it worked exceedingly well on 40 meters. I have over 225 countries worked, mixed all bands using CW, very limited SSB, but quite a few in the digital modes such as PSK, MFSK, RTTY, and HELL. All of this while running fairly low power, well below the 100 watt level.

I have had no complaints, and although I am (was?) operating stealth, I would normally hear people talking in the dining room — that's where everything is hashed out. I have never heard anybody complain about having a problem with their phones or other electronic devices. Mine are free of any RFI. 73

The Interrelationship of the Coriolis Force, the Helix Effect, and So-called Einstein Antennas

continued from page 29

distance increases the gravitational force by a factor of 256. The binding energy of a molecule is so small that the mass changes by just a few parts per billion, but the strong nuclear force linking the protons and neutrons in the nucleus of an atom is much more powerful than the electromagnetic forces that hold molecules together.

How do we do this? Simply by reversing the RF helix flow, counterclock wise or clockwise movement in the coaxial, or by reversing the gravitational pull of nature.

How? By wrapping the wire or coaxial with a flexible magnetic strip tape obtainable at Edmund's Scientific or Radio Shack. They are inexpensive and normally have 1,400 gauss strength — the higher the gauss, the better.

Magnets come in a variety of forces and types, some of which have been around since the beginning of time,

such as a natural lodestone magnet. Others include ceramic permanent magnets, electromagnets, ferromag magnets, rare earth, neodymium iron boron (NdFeB), and samarium cobalt (SmCo)-mix.

Coaxial cable is normally manufactured from copper or copper mix, so the magnets will not actually be attracted to or "stick" to the coaxial, but will work by the magnetic force acting through the coaxial. Obtain flexible magnetic tape with a sticky mastic backing, or adhere to the coaxial with electrician's or Scotch tape. With the flexible magnetic strips suitable for this, you will have to experiment and try right- or left-hand wrapping to see which works best for your specific frequencies involved.

The spacing of the magnetic tape will depend on the radio frequency in use, and for the best reception and noise removal coming down the coaxial. All of this is reciprocal, working to remove noise on receiving as well as transmitting. As with water going down a drain, you are simply electronically reversing the natural electron flow in the coaxial.

Due to the "skin effect," i.e., RF traveling along the surface of the wire, the higher you are in frequency the more noticeable the improvement will be. Each installation will be a custom experiment, both as to right- or left-hand helix wrapping, as well as spacing between the magnetic strips, based on the Earth's gravitational pull where you live, as well as your individual distance from the Earth's Equator due to the Earth's gravitational Helix Effect. The more magnetic tape you use, the more magnetic molecules will be involved with increased improvement due to additional high energy output of megagauss oersteds.

You also can experiment with electromagnets such as a bulk video and audio tape erasers. The thinner in diameter the coaxial, the more magnetic energy will travel to and through both the outside braid and also the center conductor itself. That, of course, can be compensated for by using stronger magnets with more gauss strengths.

All of this should result in a six- to

nine-decibel noise reduction on both receiving and transmitting, or one to one-and-a-half "S"-units in improvement.

So, the next time you flush something down the drain, remember this article. [*Hmmm ... ed.*] 73

Autobiography of Everyham — Part 2

continued from page 34

he was going somewhere in the direction of where I worked. Although it may not have been an emergency, driving those distances in rush-hour traffic even back then was not taken lightly (this was in the late '80s or early '90s). Fortunately, this was the only more serious assist I had been involved with; the rest have been relatively minor to date, in the form of rendering help with driving directions and technical advice.

What will be the future of ham radio? I doubt any of us have all that clear of an idea. At times, when I get fed up with some of the shenanigans I hear, I'm not even sure about my own future in ham radio. In spite of these variables, a few things will always stay the same: It's possible to have a well-balanced life, even when one particular interest — like ham radio — is heavily woven into the daily fabric of what we do. Secondly, even if I should get tired of the less than savory activity I hear out there to the point where I feel like tossing my gear out of the nearest window, the unique experiences I've had along the way will always be priceless. 73

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Pluses and Minuses of "Smart" Batteries

continued from page 41

The author of many articles and books on battery maintenance technology, Mr. Buchmann is a well-known speaker who has delivered technical papers and presentations at seminars and conferences around the world.

About the company

Cadex Electronics Inc. is a world leader in the design and manufacture of advanced battery analyzers and chargers. Their award-winning products are used to prolong battery life in wireless communications, emergency services, mobile computing, avionics, biomedical, broadcasting, and defense. Cadex products are sold in over 100 countries.

Note: This article contains excerpts from the second edition book entitled *Batteries in a Portable World — A Handbook on Rechargeable Batteries for Non-Engineers*. In the book, Mr. Buchmann evaluates the batteries in everyday use and explains their strengths and weaknesses in laymen's terms. The 300-page book is available from Cadex Electronics Inc. through [book@cadex.com], tel. 604-231-7777, or most bookstores. For additional information on battery technology, visit [www.buchmann.ca].

73

THE DIGITAL PORT

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log program but have not yet looked into its workings. Logs are important to most of us, and I am sure there is one available to answer our needs.

Incidentally, the little log system is based on a database that is available, free of course, and packaged with some Linux distributions. Berkeley Database, I believe is the name, and if it is in your Linux system, your log should work. I must be careful making too many promises, as one ham told me it needs to be the correct version of the database. Another one of those Linux "if" statements, and I do not recall what was correct except I know I fell into it and came up smelling good, which translates to: I have the correct flavor here.

As you may surmise, getting all this system together and working was one great challenge for me. Some hams were surprised that I had so many reversals. However, it was quite a learning experience and the pleasure to finally see it work is likely much more profound than if it had gone easily. I hope your introductory experience with Linux is a bit smoother.

Those pictures on the MFSK

I mentioned last time around about the new PIC mode in MixW MFSK, and I predicted we would be standing in line to use it. Well, yesterday that was as near true as I have seen. There were truly wall-to-wall signals just above the 14.080 frequency where most of the PIC action occurs. But, possibly, it was just a busy day for digital. I looked in on the PSK31 area and it was nearly as bad (or good?) even though the signal width is more accommodating for more users.

Anyway, there have been some of us who had problems getting rid of the slant

in these little images. And the slant was very pronounced in certain cases. Mine was a serious problem which became a bit embarrassing as I tried to sort it out.

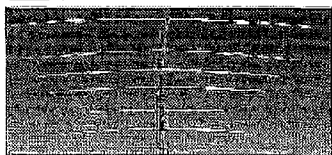
I was one of those who was of the opinion I could use the "seat-of-the-pants" approach and eventually come out on top. Well, you can't — especially if your card settings are as out of whack as mine were. I got the receive slant seemingly well under control by-guess-and-by-gosh, but there was no way the transmit was even going to come close.

So eventually, the news came along, originally by a post on the MixW reflector from Nick UT2UZ, how to accomplish straightening the crooked pictures. It involves a basic, having to do with setting the sample rate on the soundcard at 11025 and not deviating from that setting. Then adjusting the RX ppm setting by use of the WWV method prescribed in the Help File. Finally, calculate the TX ppm by using a loop-back TX to RX with a calculator provided in the MixW software that gives you the constant to finish the job. I did it and was surprised — more than pleasantly. Perfection. I have included the instructions on my Web site for these adjustments.

That's about all for this month. Have fun, and keep those digital fires burning. 73, Jack [KB7NO@att.net].

73

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HAMSATS

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joined the UN committee for space research for peaceful purposes.

The ham-radio portion of SO-50 is a Mode-J (two meters up and 70 cm down) FM transponder. Both uplink and downlink antennas are simple quarter-wave whips, one on top and the other on the bottom of the space frame. Power output on 70 cm is 250 mW. The satellite was tested during the first week of January, 2003, and was subsequently released for ham operation. The uplink is on 145.850 MHz. Since SO-50 shares the same uplink with AMRAD-OSCAR-27 and Saudi-OSCAR-41, the new hamsat requires that users transmit a CTCSS tone of 67 Hz for access. The downlink is on 436.800 MHz.

Contacts via SO-50

While most other FM satellites have a continuous downlink when active, SO-50 is more like an FM repeater with a very short squelch tail. This means that if you simply listen for the satellite, you may hear nothing

even though it is on and ready for use. You will need to transmit on the uplink (don't forget the 67 Hz tone) when the satellite is in range, while simultaneously listening and tuning around the downlink frequency. Even if you are doing everything right, don't be surprised if nothing happens. A control station must activate the satellite on every pass. For North America, the controller is near the east coast.

Passes are relatively short due to the low orbit, and the Doppler shift and antenna tracking requirements need some practice to make good contacts. At the beginning of an overhead pass, transmit about 2.5 kHz low and receive about 10 kHz high of the listed frequencies. When the satellite has passed, and is headed away, transmit a few kHz high and listen almost 10 kHz low. Low-elevation passes are not as difficult, and the receiver on SO-50 is very sensitive. The satellite's quarter-watt transmitter with whip antenna isn't quite enough for most HT work, but a decent home station with directional antennas does fine. Can you keep up with all of the operational hamsats in the sky? I doubt it, but take some time to check out our newest resources, and enjoy. **73**

ON THE GO

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Sometimes these are repeats of what is offered in the club newsletter, but at other times you may find a more extensive collection of ham and associated gear, such as computers.

There are also dedicated virtual hamfests on the World Wide Web. The most widely known is probably [<http://www.qrz.com>], which provides not only a great virtual swap meet but also is a popular call-sign lookup site. Naturally there are others such as [<http://www.vhamfest.com>], and other, smaller sites. There are products for sale, and products wanted usually offered only by individuals as opposed to dealers. There are some good deals to be had, if you know what you are looking for. Some of the descriptions are sparse with only the brand and model number being listed, so if you're familiar with the specifics of a particular radio, you'll be well served.

Virtual hamfests are somewhat casual. If you find a product you like and send a note to the seller you may not get an answer in a timely fashion. This can be frustrating, but on the other hand, you can make some great deals.

And, of course, there are the on line

auction sites like e-Bay [<http://www.ebay.com>] that offer virtually anything that someone has to sell. There is a fair representation from the ham community and often a good selection. They do offer, in many cases, the ability to pay by credit card and have some degree of protection from fraud. Nothing is fool-proof, however.

On-line auctions can be frustrating, though. Some experienced auction participants not only hold back their bids until the last minutes of the auction but may even use software that automatically enters a bid at the last moment. More than once I've found an item interesting, but never had to explain it to my XYL because someone else outbid me in the final seconds.

Whether you are new to the hobby or expanding your options, there are many ways to find just what you need. If you've been working the local repeater with your handie talkie, why not check out the options for an HF mobile rig? How about six-meters for the commute to and from work? Maybe some items for your emergency "grab and go" kit.

Go out, have fun, and let me know what treasures you have found! **73**

NEVER SAY DIE

continued from page 26

though the plaintiff would be absolutely right, he might lose.

When a state institutes a property tax it is instantly taking over ownership of all private property in the state — land and buildings. The "owner" is allowed to use the property within limits set by the state, county and town, but if the owner stops paying rent (tax), he's evicted and the property auctioned off to another renter.

One might try to argue that the state is providing certain services which could be considered as compensation. Not unless they are new services and provide a service comparable to the value of the property confiscated. Any other services were already being enjoyed (at least in some cases) by property owners, so they wouldn't count as compensation.

New Hampshire, with one of the highest property taxes in the country, has propagated the myth of low taxes because there have been no income or sales taxes. Well, almost none, as long as one doesn't count the room and meals tax, which nets the state over \$13 million a year.

By the time one adds up the profits

from the state liquor stores in every town and near every border, vehicle, snowmobile and boat licenses, fishing and hunting licenses, profits from the Cannon Mountain tramway and skiing area, The Flume, highway tolls, and who knows how many other revenue sources — oops, I almost forgot the state lottery — we could be in very good shape if we'd stop state employee bloat and stop wasting money on schools that are getting progressively worse as we spend more and more on them.

A Major Opportunity

Old-timers have undoubtedly forgotten by now my enthusiasm over 2m FM and repeaters in 1969, when I got so excited about them that I published hundreds of articles in 73, several books, the first repeater directory, and even started a special journal devoted to the subject. I got so excited about being able to make phone patches via a little HT while skiing down the New Hampshire and Aspen mountains that I predicted that the public would soon be using this technology to make phone calls from anywhere to anywhere.

When I first got excited there were a few dozen ham repeaters. A few years later we had thousands, covering most of the country, plus hundreds more all around the world. Heck, they even had one in Swaziland!

Our technology was soon commercialized by Motorola and G.E., and many of the repeater pioneers did very well, cashing in on the explosion of cellular telephones.

In 1975, when the first microcomputer kit was marketed, I quickly started the first magazine devoted to micros, hoping that I'd be able to duplicate my success with ham repeaters. Again, the pioneers did well. In 1976 Bill Gates left Harvard with a primitive version of BASIC he'd done for a class project and went to work for MITS, where I first met him a couple weeks later. He's done pretty well.

In August 1976 I heard about Steve Jobs and Steve Wozniak and their Apple, so I visited them in Jobs' home. Steve's done well, too.

Now I see a new technology that has the potential to turn into as big (or bigger) an industry as the personal computer. There's every reason to believe that the pioneers in this new field have

Continued on page 61

We pay SCASHS
(well, check)
for articles!

SEND FOR "HOW TO WRITE FOR 73"

A Note on the Shuttle

The Space Shuttle Columbia disintegrated over Texas a few hours ago, just 16 minutes from landing in Florida. By the time you read this, of course, two months will have passed and many of the details will have faded from memory. Nonetheless, I'll use this opportunity to express my condolences to the families, friends, and associates of the seven astronauts who perished today.

I am personally touched by this sad event since I spent dozens of hours in the cockpit of a commuter airliner during the early '90s with the brother of Shuttle Commander Rick Husband. The effects of this tragedy will certainly be felt far and wide; not least in the amateur radio community since three of the other STS-107 crew members were hams. They were Kalpana "KC" Chawla KD5ESI, David Brown KC5ZTC, and Laurel Clark KC5ZSU.

Many readers will remember that astronaut Owen Garriott W5LFL became the first amateur to broadcast from space in November 1983. That mission was also flown aboard the *Columbia* which was the first spacecraft in history to carry an amateur radio aboard as part of the official NASA payload.

As always, hams have responded to this tragedy with a helping hand, notably the Amateur Radio Emergency Service (ARES) members in Nacogdoches, Texas. According to some early reports, they have volunteered to help local officials and NASA to locate and catalog debris from the *Columbia* shuttle. The ARES volunteers are members of the Nacogdoches Amateur Radio Club, which apparently has had an ongoing relationship with the space program through the Space Amateur Radio EXperiment (SAREX) and the Amateur Radio on the International Space Station (ARISS) programs. I extend a personal commendation to the ARES members for their devotion to community service in the true spirit of radio amateurs everywhere.

Special Forecast

Solar activity is forecast to remain low for most of April, so Good

April 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
		1 F	2 F-P	3 F-P	4 F	5 G
6 G	7 G	8 G	9 G	10 F-G	11 F-G	12 G
13 G	14 G	15 F	16 F-G	17 F	18 G	19 F-G
20 F-P	21 F-P	22 F-G	23 F-G	24 P	25 F-P	26 F-P
27 G	28 G	29 F-G	30 F-P			

EASTERN UNITED STATES TO:												
GMT	00	02	04	06	08	10	12	14	16	18	20	22
Central America	(15) 20	(15) 20	20 (40)	x	x	x	(10)	(10)	(10-15)	10 (17)	10-15	12-20
South America	(17) 20	20 (40)	20 (40)	(20-40)	x	x	x	(10)	(10)	(10-15)	10-15	10 (20)
Western Europe	(20-40)	(30-40)	(30-40)	(40)	x	x	(15-20)	(10-20)	(10) 17	15-20	(15) 20	(20)
Southern Africa	(17) 20	(20-40)	(20)	(20)	x	x	x	x	(10)	10 (15)	12 (17)	(15-20)
Eastern Europe	x	(30-40)	(20-40)	(17-20)	(20)	x	x	(10-15)	(15)	(17-20)	(20)	(20)
Middle East	x	(20)	20	(20-40)	(40)	x	x	x	(10-15)	15	(17-20)	(20)
India/Pakistan	(17-20)	x	x	x	x	x	x	(15-17)	x	x	x	x
Far East/Japan	(17-20)	(20)	x	x	x	x	x	x	x	x	x	(15)
Southeast Asia	(17-20)	x	x	x	x	x	(17-20)	(10-15)	x	x	x	x
Australia	(15)	(17-20)	x	x	x	(20-40)	(20)	(10)	x	x	x	x
Alaska	(15) 20	(20)	(20-30)	(30-40)	(40)	x	x	x	(15-20)	(10-20)	(10) 17	15-20
Hawaii	(15) 20	20	(20-40)	(20-40)	(40)	x	x	x	(15-20)	(10-20)	(10-20)	15-20
Western USA	15-20	20 (40)	20 (40)	(20) 40	(30-40)	x	x	(10-20)	10 (20)	10 (20)	10 (20)	(15) 20
CENTRAL UNITED STATES TO:												
Central America	(15-20)	20 (40)	20-40	20-40	(20-40)	x	(10-20)	10-20	10-20	10 (20)	10 (20)	10-20
South America	(15) 20	17-30	20 (40)	20 (40)	x	x	x	(10-20)	10 (20)	10 (15)	(10-20)	12 (20)
Western Europe	(20)	(40)	(40)	x	x	x	x	(15)	(15-17)	(15-20)	(17-20)	(20)
Southern Africa	20	(20)	(20)	(20)	x	x	x	x	(10)	(10-15)	(10-17)	(15-20)
Eastern Europe	(20)	(20)	x	x	x	x	x	(15)	(15-17)	(17-20)	(20)	(20)
Middle East	x	x	x	x	x	x	x	x	(15)	(15)	(20)	(20)
India/Pakistan	(17-20)	(15-20)	x	x	x	x	x	(15-20)	x	x	x	x
Far East/Japan	(17-20)	(20)	x	x	x	x	x	x	x	x	x	(15)
Southeast Asia	(15-20)	x	x	x	x	x	x	(20)	(10-20)	x	x	x
Australia	(15-20)	(20)	x	x	x	x	x	(15-20)	15	15	15 (20)	
Alaska	15-20	(15) 20	20	20 (30)	(30-40)	(40)	x	x	x	(10-20)	10-20	10 (20)
Hawaii	15-20	(15) 20	20 (40)	(30-40)	(40)	x	x	x	x	(10) 12	10-15	(10) 17
WESTERN UNITED STATES TO:												
Central America	10-20	15-20	15-30	(14) 40	20-40	(30-40)	x	(15-20)	10 (20)	10 (20)	10 (20)	10 (20)
South America	(10) 20	(15) 20	20 (40)	20 (40)	x	x	x	(10-20)	10 (20)	(10-15)	10 (15)	10 (20)
Western Europe	x	x	x	x	x	x	x	(15-17)	(15-17)	(17-20)	(17-20)	
Southern Africa	(20)	(20)	(20)	(20)	(20)	x	x	x	x	(10-12)	(12) 17	(15-20)
Eastern Europe	x	x	x	(17-20)	(17-20)	x	x	(15)	(15)	(15-17)	(17-20)	(20)
Middle East	x	(20)	(20)	x	x	x	x	x	(15-17)	(20)	(20)	(20)
India/Pakistan	x	(17-20)	x	x	x	x	x	x	(15-17)	x	x	x
Far East/Japan	10-20	(20)	x	x	x	(40)	(40)	x	x	x	x	(10-20)
Southeast Asia	(10-15)	(10-15)	x	x	x	x	x	x	x	(15-20)	(15-20)	(10-15)
Australia	(10-15)	(15)	(17-20)	x	x	x	x	x	(15) 20	(15-20)	(15)	(10)
Alaska	(10) 20	(15) 20	20 (40)	(20) 40	(30-40)	(40)	(40)	x	x	(10-15)	10-15	10-20
Hawaii	(15) 20	20	(20-40)	(20) 40	(30-40)	(40)	x	x	x	(10-20)	(10) 20	15-20
Western USA	15-20	20 (40)	20 (40)	(20) 40	(30-40)	x	x	(10-20)	10 (20)	10 (20)	10 (20)	(15) 20

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

(G) propagation conditions should predominate throughout the month. However, coronal hole effects are likely to cause some trouble and could strongly influence the HF bands, especially during the first few days. This will be followed by nearly two weeks of undisturbed conditions with only minor flares causing transient disruptions. The latter half of the month will be less consistent, with Fair-to-Poor (F-P) conditions prevailing about fifty percent of the time, but only the 24th is forecast to have Poor (P) conditions all day.

Although April is the month when DXing historically begins its inexorable slide into the summer doldrums, there are still lots of good opportunities to be found until late spring. The most promising band is 15 meters which will have worldwide "pipelines" spanning both the daytime and nighttime sectors. 10 meters should also start out fairly strong but will rapidly decline as the weeks pass, especially on paths to Europe. 20 meters is likely to be strong at night, but daytime paths will be unreliable a good part of the time. 40 meters should be in pretty good shape at night as well, but 15 and 20 will probably be more interesting due to lower noise levels.

Band-by-Band Forecast

10-12 meters

There should be decent opportunities into Europe, Africa, and Asia early in the month, but openings will decline rapidly as April progresses. Latin America and South America will be the mainstays and should remain workable from shortly after noon through early evening. Daytime short-skip can range from 1,000 to over 2,200 miles.

15-17 meters

Excellent worldwide propagation will be available from sunrise through mid-evening. Europe ought to be workable most of the day, even during late afternoon. Polar paths should provide good coverage in southern Asia, especially if you follow the sunrise grayline across the continent. Japan and the Far East might also be workable in the morning, with an occasional pipeline to Indonesia before noon. Short-skip will average between 1,000 and 2,100 miles.

20 meters


Expect strong and reliable conditions after dark. Only mediocre propagation will be found most days, but some excellent opportunities can still be found right after sunrise and late in the afternoon. The evening hours

after sunset should be the most fruitful however, with many interesting contacts in the Middle East and North Africa — especially during the hour before their local sunrise. Expect plenty of traffic from Eastern European stations to compete for those Middle Eastern contacts though. Short-skip will fluctuate between 500 and 2,300 miles.

30-40 meters

Good worldwide opportunities should be available from sunset to sunrise despite rising QRN (atmospheric noise). The Caribbean, Central America, and South America will be the mainstays with Australia and Southeast Asia providing most of the other opportunities. Short-skip at night can range from 500 to 2,500 miles but will be well under 1,000 miles during the day.

80-160 meters

Propagation on these bands is fading fast due to rising atmospheric noise levels, but opportunities will still be found in the southern hemisphere during the quieter periods. These are obviously nighttime bands with short-skip ranging from 1,000 to 2,000 miles, but daytime DX contacts can be made if you can work multi-skip paths toward northern South America. Daytime skip is limited to 250 miles, however. 

NEVER SAY DIE

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the potential for becoming the next generation of zillionaires. Watch them from your couch as they parlay a few hundred bucks into vast fortunes, and have the most fun of their lives.

The Technology

Now that you can get a digital video camera, editing system and DVD burner for under \$3,000 instead of tens of hundreds of thousands, the lid is off for an explosion of new video products. It's a lot like the opportunities that we had when the first microprocessor chips arrived, bringing us a ten times drop in computer prices.

Mainframe systems were in the million dollar range. Then came minicomputers, which wiped out all but one of the mainframe makers (IBM) with their hundred thousand dollar systems. Next came the microcomputers (personal computers) in the ten thousand dollar bracket and they wiped out the minicomputer companies. There's nothing like a ten times drop in prices to generate a new industry and wipe out an old one.

Well, it's happening again, this time with video.

You saw what happened with *The Blair Witch Project*, right? That was a movie anyone with a thousand dollar digital video camera and an iMac \$1,500 computer could have made using a few friends for actors.

No, I'm not suggesting you get into competition with the big studios and duke it out with the distributors at the Cannes Film Festival. Not when there is a brand new totally undeveloped market out there crying for product.

The Crying Need

When home schooling hit the cover of *Time*, complete with a seven page article, that should have been enough to show up on the screen of even the most dormant of entrepreneurs as a blip. Big blip. The article reported that there are nearly a million kids being home schooled today, double that of five years ago.

Well, it's only logical, as more and more parents get fed up with the public school system's increasing inability to teach children reading, writing and arithmetic. The government school system is awful and getting awfuller. And the more money they've poured into it, the worse it's been getting.

The Opportunity

It's a double opportunity. Not only is there a million kid home schooling market for educational materials, but you've also got tens of millions of frustrated parents who'd love to find supplemental educational stuff to make up for the lousy textbooks and teachers public schools offer.

Desperately needed are video programs which are so much fun that kids will be nagging their parents to buy them — programs which help youngsters to understand all of the things they need to know to cope with the world. There's a need for programs which cover all of the stuff in the K-12 curriculum, plus a bunch more on the things schools should be teaching and aren't.

Our socialist public school system will be up against, for the first time, serious competition from entrepreneurs. Competition has been proven to improve product quality and lower its cost. And that's what is desperately needed today. Our children are being screwed by the government's schools. We're all paying a premium price for a poor and getting poorer product.

If you're interested in the details and want to get yourself into a screaming fit over what's happening, just read some of

the very-well-researched books about our school system.

Like? Gatto's *Dumbing Us Down* and *The Underground History of American Education*, Sowell's *Inside American Education*, Kramer's *Ed School Follies*, Iserbyt's *The Deliberate Dumbing Down of American Education* and Roche's *The Fall of the Ivory Tower*.

The market for well-done educational programs is far more than a million American home schooling families and a few million frustrated parents of public school kids who aren't learning — it's a worldwide market. Billions of parents need low-cost high-quality educational programs for their kids.

The Revolution

Imagine billions of children excitedly buying and swapping DVD programs just because learning is so much fun! The ten-year-old who gets interested in electronics will be able to learn the basics, and then go on to find out how radios, televisions, cell phones, faxes, computers, and so on work. No memorization, no exams. No grades. Just the excitement of learning. The work bench for building a power supply or a radio will be virtual, complete with all the needed tools and test equipment.

I learned about radios by starting with a chalk-and-talk lecture — then I went into a lab with a bunch of fiendishly disabled radios to repair. Wow, that was FUN! Now all that can be done in a virtual lab, complete with signal tracers, oscilloscopes, and test meters.

This new technology will force the public school system to either make major, major changes or be a relic of the past — like the bow and arrow for war and the horse for transportation.

So, are you going to bystand this revolution, or get in on the fun? The equipment needed to get going isn't very expensive, but you are going to need all of the creativity you've left after the public school system's 16-year effort to kill it.

I predict that in about twenty years we're going to start seeing a whole new generation of geniuses emerging, giving us fantastic art, music, and performances. With the bridge between the normal and the paranormal now being opened, we'll again be seeing some amazing new scientific breakthroughs.

Motivation

Kids just naturally want to learn. They're learning while they are still in the womb. Any parents who do not read *The Prenatal Classroom* by Carr and Lehrer are doing their child a lifetime disservice, as well as lowering their

child's IQ permanently. You can also substantially increase a baby's IQ by teaching it to sign when it is seven or eight months old — well before it can talk. Babies are busy learning every minute, and it takes a lot of punishment to put a stop to their thirst for knowledge. Ask any parent who's been through their children's "why?" age.

Psychologists tell us that most preschool children are highly creative — they learn at many times the rate of adults. But then both creativity and learning dramatically slow down when they enter public school. By the 3rd grade less than 5% of children are still creative, and learning levels are at the low they'll maintain through the rest of their lives.

In the early computer days I had a lab with 30 work stations for developing software for personal computers. I opened the lab evenings and weekends for local teenagers, who were so excited about computers that they brought sleeping bags so they could nap when they got too tired to sit up. My computer staff said these kids were like industrial vacuum cleaners with questions about the computers.

All you have to do is get kids interested in something and get the hell out of their way.

The Sudbury Valley School in Framingham (Mass.) has no classrooms, no curriculum, no memorization, no exams, and no marks. The kids aren't even separated into grades or by age. They have a great library for research, and a staff willing to teach anything a group of kids decide they want to learn. The result is kids who are outstanding and way ahead of public schoolers in creativity and learning ability, yet the school costs less than half as much as the nearby public schools to run. Read *Free At Last* by Daniel Greenberg.

The above-referenced books are reviewed in my \$5 *Secret Guide to Wisdom*, where you'll also find their sources.

Still At It

Keeping up with the Clintons is fun. As you know, Hillary, as the senator from New York, now benefits from the unbelievably generous retirement plan the Senate voted for itself. None of this Social Security stuff for them.

In order to qualify as New York residents, the Clintons bought a million-plus house in Chappaqua. They are, of course, entitled to Secret Service protection for life, so they built a house for the Secret Service residence. The Clintons charge the Secret Service rent that is about equal to their mortgage payments, so we taxpayers are paying for them to buy their home.

Wood Rat Problem

The *Chronicle of Higher Education* is concerned that Professor Janet Wright of Dickinson College can only do her wood rat research during the summer. It seems that wood rats are disappearing from some eastern states and no one knows why. Alas, Professor Wright is so tied up teaching during the academic year that she has to do her research during the summer.

When she solves the wood rat problem there will be an article in some academic journal which very few people will read. Wow!

Professor Michael Womack, a Macon State College biologist, has been kept busy counting mosquitoes for the Federal Emergency Management Agency. Carlow College's Professor Jane Dirks did a study of the ethnic backgrounds of people she meets, while walking her dog, which was presented at the national meeting of the American Anthropological Association. Earlham College's Professor Howard Richards devoted part of his summer vacation to "organizing a whole movement to reconstruct the world." Good-o.

Multiply that by tens of thousands of professors pursuing trivial research in the publish-or-perish academic world. And we're paying for this mountain of crapola.

Forty years ago most professors spent 12 to 15 hours a week in class. Today six hours a week is the norm. That means they need twice as many professors and twice as much money for salaries. More than twice, since professors' salaries have been going up much faster than inflation. And so have tuitions, surprisingly.

Will the 40-hour-a-week public ever wise up to this huge scam?

It's Your Money!

Our military, with the blessing of the White House and Congress, spent billions of our money invading Somalia to bring order. We left chaos. Billions more invading Haiti to restore democracy, but we left tyranny. Then came Kosovo to create a multiethnic democracy. Har-de-har. So what did the mightiest military power on earth spending billions of our money accomplish? Nothing positive.

Now we're going into Iraq. Again. If you're interested in the gory details, you might want to invest \$11 for the paper edition of *Fool's Errands* by Dempsey and Fontaine from Cato Institute, 1000 Mass. Ave NW, Washington DC 20001; 800-767-1241.

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$10 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively - once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moonoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 100 Editorial Essays: \$5 (#72)

1997 157 Editorial Essays: \$8 (#74)

1998 192 Editorial Essays: \$10 (#75)

1999 165 Editorial Essays: \$8 (#76)

2000 101 Editorial Essays: \$5 (#77)

2001 104 Editorial Essays: \$5 (#78)

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Colloid Reprint. April 97 article on a silver colloid maker, history, and how to use the stuff. \$5 (#98)

Colloid Clips. Three 9V battery clips, 2 alligator clips & instructions. \$5 (#99)

AC-powered Colloid Kit: 12V power supply, silver wires, reprint, including priority mail shipment. \$37 (#82)

Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry; Schools in 2020: another \$ trillion industry. Anthrax, a simple cure. Dowsing: why and how it works. \$3 (#86) My 1992 *We The People Declare War! On Our Lousy Government* book—360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was \$7. I found a few in the warehouse. \$3, while they last. Great book! (#83)

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NEVER SAY DIE

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Delighted!

Even though in my editorial essays I've reviewed the books by Ott and Lieberman on the importance of sunlight to your health, and even though their books are reviewed in my *Secret Guide to Wisdom* — I haven't been able to get you to go outside every day to get those all-important UVs into your eyeballs. And that's without any eyeglasses on. I threw out all my sun glasses after reading what they could do to my health — even Joe Sugarman's Blu-Blocker glasses.

Are you going to wait for God to smite you before you start taking care of your body? Yes, it's a nuisance to take off a half hour a day around noon to fast walk a couple miles and get those UVs. Hey, do you think your ancestors sat around their caves all day whittling sticks? They were out there in the sun running around. They chased game, gathered food, and killed as many of those damned Neanderthals as they could. That was hard work. And when it got dark they lay down and slept until it got light again. They weren't sitting around watching TV with a bowl of snack food or sitting in a bar somewhere.

UVs will keep you healthier and less depressed. 73

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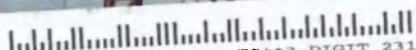
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73 Amateur Radio Today

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QRX...

Wouff Hong and Rettysnitch

a. "The Wouff-Hong is amateur radio's most sacred symbol and stands for the enforcement of law and order in amateur operation."

b. "The Rettysnitch ... is used to enforce the principles of decency in operating work."

— *The Radio Amateur's Handbook*, 1930, p. 11.

In 1930, the *Handbook* had pictures of both instruments of enforcement. By 1936, only the Wouff-Hong appeared, and by 1947, the *Handbook* had deleted both photos. Just when we needed traditions of law and order and of decency in amateur operations to

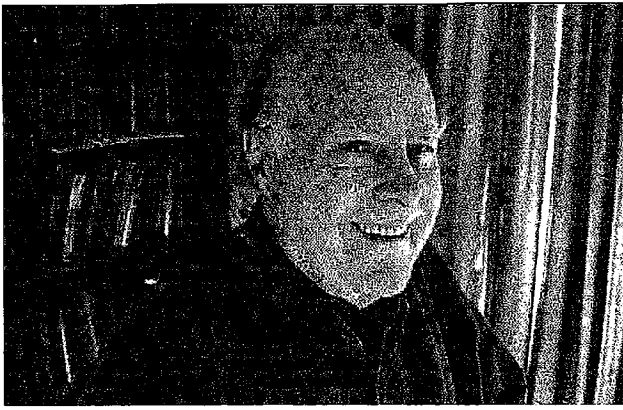
guide its growth in the post-World-War II explosion of technology and easier licensing, the symbols had disappeared from view.

Many of today's hams have no idea what a Wouff-Hong and a Rettysnitch look like. To rectify that gap in hamdom's essential history: The two main pieces appear to be wood banded by metal strapping and by heavy wire. What the sketches cannot convey is the darkness at the upper end of the longer wood piece, as if stained by blood or purified for its grave duties in the fires of purgatory — or both.

The Rettysnitch is an all-metal tool. Of the five teeth

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Wise Up & Beat the Odds

NEVER SAY DIE

Wayne Green W2NSD/1

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www.waynegrain.com

Afghanistan

Having been there and operated from Kabul as YAINSD for a couple weeks a while back, I have a special interest in that messed up country. Here's a country with little infrastructure or government. There wasn't even any licensing authority when I was there so I picked my own call.

The country was a sitting duck for the Russians ... at least until the US started sending over billions in arms. I'm not sure what the Russians wanted with the place, nor why we sent arms to stop them. Maybe we just didn't like the idea of Russia trying to grab a country by force. The country is in the middle of nowhere and it's only natural resource was warring tribes led by local warlords.

When the war was over I predicted that Afghanistan would be in a terrible a mess if we didn't move in and help them put the country together. I explained that the warlords in each part of the country would be fighting each other again. And that's just what happened, with the Taliban eventually controlling most of the country ... thus guaranteeing to keep the country 1,500 years behind the rest of the world.

So here we are a second time, pulling out and leaving the country to the mujahedin to fight each other ... blowing a chance to help get the country organized. What a lousy example we're setting!

Here's a country with no exportable products other than opium. No industries. Few

paved roads. A few Muslim brainwashing schools where kids sit memorizing the Koran. Few towns with power, water supply, or sewage systems. Telephones, the Internet, TV, movies? Har-de-har.

My recipe for bailing the country out of the Middle Ages would be to install a network of radio and TV stations. Provide 'em with both local language and English programs so we can start them learning English. The French may hate it, but America's power has helped make English the language of world commerce. Set up a factory to make the cheapest cars possible ... like go-karts. Believe me, everyone in the world would like to get off their ass. Send a team to do a study to find out what raw materials are available, and then what markets there are for the products within easy shipping distance ... just like Singapore did when Malaysia didn't want that pest hole connected with their new country after the British pulled out.

Singapore went to Europe and got the funding to build high-rise apartments for their Chinese workers, who had been living in tin huts, and to build new factories. By 1966, when I first visited, the country was already one of the Asian tigers. When I last visited in the late '80s, cranes were busy building all around the city.

In New Caledonia, the French solved the warring tribes problem with television. The wars stopped while everyone made enough money

to get power and TV sets for their homes. Then they were busy making money to buy the advertised products. And that was the end of the tribal wars.

So, let's get busy and encourage our shortsighted government to help Afghanistan out of the past and at least into the 20th century.

My Advice ...

... which no one asked for and fewer will pay attention to. Yes, it has to do with Iraq. Been there. I even visited the ruins of King Nebuchadnezzar's palace. It was in June and the temperature was 120° in the shade. The only shade being an umbrella the taxi driver held for me. This place was so remote there weren't even any souvenir stands around.

Oh, yes, my advice. Have we gone into Iraq because of Saddam? Or Oil? Or, could it be political, because every time we get into a war our economy booms ... and there's that little ol' election coming up next year? WWII was what finally bootstrapped us out of the 1930s depression. I'm not sure I understand how it works, but for some reason when our factories stop making consumer goods and turn out military hardware and bombs which are then destroyed, it's good for our economy.

Even though the Democratic Party is in total disarray, with the queue of presidential hopefuls getting longer every day, Bush Jr. could be worried about being re-elected if the economy stays stinko. Or

he may just feel a compulsion to make his dad feel better about him by finishing the job in Iraq B Senior left undone.

If you, despite my constant urging, are not taping the nightly *Coast-to-Coast AM* show and listening at your convenience, then you missed the March 6th Ed Dames interview. Tsk. Major Dooms, as usual, had only the worst of predictions he and his group have remote viewed.

He says they looked into the near future and found that shortly after we got started attacking Iraq our good buddy Kim Son II would send his hordes (he's got a million troops) across the DMZ into South Korea, using the many long tunnels they've been digging for the last 50 years.

And, if that isn't bad enough, once the 37,000 American troops based in South Korea get rushed to the DMZ in response to the invasion, II's guys will hastily retreat and a nuke in one of the tunnels will be exploded. Pfft will go around 37,000 Americans. Hmm, what next? Nuke Pyongyang, where there is little but a few civilians?

And remember, the last time we were in Korea fighting we got the upper hand and were heading into North Korea when China sent down reinforcements and stopped us.

My advice? Close the PX and pull our troops out of Korea pronto. Then get South Korea to open the border and invite any North Koreans to come on down and resettle. We could offer to help pay the tab. And the offer would

also be open to any North Koreans who have fled to China to avoid starving. Bribery has always been a fact of life in Asia.

Last year NH Rep. Charles Bass showed photos of his recent visit to North Korea. He mentioned that we know there are many tunnels under the DMZ, we just don't know where they are. I tried to get him interested in having some expert dowsers dowse a map of the area and show exactly where they are. I got nowhere.

One of the Iraq inspection team members was on *Coast-to-Coast*, explaining how for years the team was prevented from inspecting one suspected site after another by the Iraq military. They flatly refused to let them see the sites.

Major Dooks also predicted that the stock market would crash. Permanently, this time. And as if all that good news wasn't enough, when George asked about all this Planet X stuff, he said his team had remote viewed it and that, as predicted by Mark Hazelwood, we'll be seeing a resulting pole shift, and that when it comes you sure don't want to be anywhere near an ocean. Ed explained that with remote viewing you can see events, but they can't be pinned down closely as to time. But I got a really big laugh when the first caller pointed out that none of Ed Dooks' past dire predictions had panned out. Maybe he needs to polish his crystal ball.

If I had any serious interest in surviving the pole shift I'd lay in a supply of ammunition, dig a hole with compacted earth and a domed roof for Sherry, me and my books, plus a good supply of seeds. Oh, and a low-powered ham transceiver.

Schools

Maybe you read where the New York City schools are spending \$11,000 per student per year. The kids ride on more buses than the city's transportation system. To what result? 60% will stay illiterate

or poor readers and never be able to make much money.

How can they get away with robbing millions of victims? Easy, the public school system is the biggest monopoly in America today. The government has made it mandatory for every child to go to school ... and for most kids that means public school. Why am I reminded of shopping in Russia under communism, where the clerks were seriously annoyed at having to serve customers. In the military it's called gold bricking ... figuring out how to get by with the least effort. Remember Sergeant Bilko?

So we have teachers who are virtually unfireable, who come from the bottom 20% of high school grads and go to teacher's ed school where almost nothing of any value is taught. I'm exaggerating? Read Rita Kramer's exposé, *Ed School Follies*. It's reviewed on page 11 of my *Secret Guide to Wisdom*. In case your memory is short, Thomas Sowell (*Inside American Education*) wrote that if he were elected president his first official act would be to issue a presidential order that all ed schools be immediately closed and all ed school professors be given \$1 million to never teach or write any books again.

How come kids are no longer learning to read? Prize-winning teacher John Taylor Gatto says reading can be taught in 100 hours. Today's ideology teaches that most children learn how to read naturally and any who aren't able are put in Special Education, which brings in more federal dollars for the school. Or, they're held back a year or two. Anyone who criticizes this is vilified as part of a right-wing conspiracy to teach phonics. The result has been a steady drop in American literacy.

Instead of teaching kids to sound out the syllables (a.k.a. phonics) so they'll be able to cope with bigger words, they're given books to read which have a restricted simple vocabulary. The next year a few dozen more words are added. Understandably, the

percentage who can't read at grade level has been going up each year.

The non-readers, to cover their humiliation when called on, become delinquent and disorderly. The school's solution to this is to put the disorderly on Ritalin or Prozac so they'll shut the hell up. If the parents object to their kid being drugged the child can be taken from them and put in a foster home.

I don't need any proof about American literacy. All I have to do is read the letters I get from people who've heard me on a talk show and have questions to ask. Many are beyond pathetic. It's unbelievable!

The solution to this mess is to totally revolutionize our educational system ... as I've been proposing.

1903

What will living in America be like in 3003? I say we don't have a clue.

A piece about how things were a hundred years ago turned up in my E-mail. That's when about 90% of Americans lived on farms; the average life expectancy was 47 years; pneumonia, flu and TB were the leading causes of death; 14% of homes had a bathtub; 8% had a telephone; there were only 8,000 cars, 144 miles of paved roads, and the city speed limit was 10 mph. 18% of homes had at least one full time domestic, and there were 230 reported murders in the entire country.

What a difference a century has made.

The above got me to thinking. Here we are in a world where most homes have not just a phone and radio, but TV and a computer ... probably with a DSL connection. And that led to my considering my part in where we are, and what I might contribute to where we'll be in twenty or fifty years from now.

Can you think of any one person who's had more of an influence on the development of cell phones, personal computers (and thus the Internet),

and compact discs than me? I've seen the future and helped make it happen.

Unless the medical industry, the food industry, the power industry, NASA, or the government has me killed, my biggest contribution, I hope, will be to help develop an educational industry that will totally change the world. Hey, why think small?

Anyone interested in helping? I should rephrase that. Is there anyone with \$1M who's interested in helping me change the world even more than I have already? That's all it'll take for us to do it. Yes, I have a business plan.

Seniors Conned Again

The February *AARP Bulletin* did a nice job of exposing how crooked many senior nonprofit groups are. Groups like United Seniors Association, The Seniors Coalition, and The 60-Plus Association are, it claims, little more than front organizations for the drug industry. That's where they get their funding, which pays for lobbyists and political advertising to promote candidates doing the drug industry's bidding. And negative ads to make sure those candidates not in the drug company pockets are defeated.

Gee, what a surprise!

As Frank Clemente, the director of Public Citizen's Congress Watch said, "This is an industry that's not only spending more on direct lobbying than any other industry but also more on front groups and related entities than any other industry."

Since it's one of the most profitable industries in the world, is that a surprise?

So, we suckers eat anything we want, eventually making ourselves sick, and the drug companies make hundreds of billions of dollars selling us stuff to ease or extend the pains. They sure don't want anyone rocking that golden barge.

Reading the *AARP Bulletin*, which is very pro prescriptions, I suspect that the

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continued from page 1

around the disk near the pointed end, only three remain. According to tradition, the other two have done their work and perished in the effort. Again, my limited skills in describing the Rettysnitch rob the device of its terrible demeanor, and therefore of its force to ensure operating decency among amateurs.

Perhaps the last time the story of the Wouff-Hong and the Rettysnitch was told was in 1934. Rufus P. Turner — famous in the annals of electronics writings — recounted "Hamdom's Traditions: A Bedtime Story for Young Squirts." But even by Turner's time, the Rettysnitch was relegated to a paragraph on the story's continuation page in the back of the magazine, with no picture. Somehow, even then, folks had forgotten that you can never have law and order without first having decency. Some pessimists think that we now have neither.

I do not subscribe to the pessimist's view. Sure, the number of rotten operators has skyrocketed, but not their proportion to the main corps of good, legal, and decent operators, capable and courteous to a fault. We should not be troubled by the size of the job of curing amateur radio of its illegalities and indecencies, for we have more folks to help use the Wouff-Hong and the Rettysnitch just where and how they ought to be used. No, not on others, but on ourselves — to make sure that we set a model for how amateur operations ought to be conducted.

Turner offers no prescription for using either device, but thought the Wouff-Hong able to beat out King Kong's brains or easily plow up acres of Manhattan bedrock. That will tell you something of the power of these machines. But it won't tell you how they came to be.

Remember T.O.M. — The Old Man — who wrote in earliest days of "Rotten QRM"? His very first article in 1917 blasted concocted abbreviations just coming into use. Among the almost unintelligible gibberish in his headphones were words like "wouff hong" and "rettysnitch," surely instruments of terrifying punishment. By mid-1917, the ARRL was besieged by orders for these contraptions, orders that could not be

filled because the League staff had never seen either device.

In 1919, after World War I (then called simply the Great War since no one could imagine doing all that destruction and killing all over again), the League once more took up its work in earnest. At just this critical time, the directors received from The Old Man a package containing an authoritative and well-preserved specimen of Wouff-Hong. Turner described the contents of the package as "the gruesome instrument of torture." By order of the directors, it was hung in the office of the Secretary-Editor, within easy reach. Its first portrait appeared in *QST* for July that year. At each board meeting, the Wouff-Hong stood on display, to the blanched looks of the humbled directors.

The Old Man also presented the world with its first glimpse of the Rettysnitch. In 1921, the monstrous machine was presented to the League traffic manager by the Washington, D.C., Radio Club, ostensibly after receiving it from T.O.M. Even at its first public appearance, two of its teeth were missing, suggesting a long history of necessary and effective use. However, to this day, the Rettysnitch has lost no other teeth. It was ordered to hang by its mate.

In the '20s and '30s, many a reproduction of both instruments, but especially the Wouff-Hong, materialized across the country. A group of hams in Flint, Michigan, created the mystic society called the Royal Order of the Wouff-Hong. The society endures to this day. The secret initiation ceremony takes place at midnight. And The Old Man has been given a name: Hiram Percy Maxim W1AW. At least, legend tells the story that way, perhaps based on the fact that T.O.M. glared at "Kitty" while reflecting on the "rotteness" of everything. Maxim did have a cat. However, true to feline nature, Maxim's cat never spilled the beans.

But what has become of the Wouff-Hong and the Rettysnitch? More important, what has become of their power to enforce both decency and law and order on the ham bands? Hams used to cringe at the thought, let alone the sight, of these dreadful tools of enforcement. But, we do not hear of them much anymore. Oh, a tremor of curiosity every now and again brings out a ripple of questions and speculation. But not much more than a ripple.

You see, today, we have much more terrifying weapons, things like Oozies and H-booms and the like. They scare us in ways that seem to make the Wouff-Hong and the Rettysnitch tame and toothless. However, even in Maxim's day, objectively more powerful weapons were used in France, like tanques and gas more poisonous than that made by Texas chili. Why were the Wouff-Hong and the Rettysnitch so powerful to those early hams?

Because those hams cared about amateur radio in their hearts. They wanted what they knew they could never have: a perfectly law-abiding

and decent radio service that would inspire young and old alike to become hams or, lacking the inclination to electronics, to become admirers of hams. Every minute of on-the-air time was a chance to show how noble a pursuit amateur radio was and should always be. They feared the Wouff-Hong and the Rettysnitch as instruments of their own consciences, as they strove to meet the standards they set for themselves.

And that is where today you will find both the Wouff-Hong and the Rettysnitch — deep in your own conscience. If they seem to hold no power, then you know it is time once more to elevate your standards a notch higher, and then to strive to achieve them perfectly. Each of us has a secret and private office where no one else may go. Above the door, facing our individual operating tables, hang two instruments, one of law and order, the other of decency. However much the outside world may neglect the tradition of these terrible reminders of responsibility, each of us possesses our own Wouff-Hong and Rettysnitch. May you never deserve their sting.

Like all legends, this one, too, must end with special words: Pass it on.

Thanks to WØPEA, via the Internet.

Ed. note: For more on the birth of the Wouff-Hong (including illustration), see our October 2002 issue.

Pop! Goes Poptronics

Popular Electronics — better known as *Poptronics Magazine* — is the latest hobby electronics publication to fail. This, with the announcement that its publisher, Gernsback Publications, is no longer in operation.

Gernsback was in the publishing business for 94 years. The January 2003 issue was the last. Negotiations are reportedly under way to provide an alternative publication to *Popular Electronics'* current subscribers.

Thanks to WBHDU, via Newsline, Bill Pasternak WA6ITF, editor.

Shake, Rattle, and Roll

The job of monitoring earthquakes, from the tiniest tremor to the largest teeth-rattler, wherever and whenever they occur on the planet, goes to the US Geological Survey. All this data is then posted promptly on the U.S.G.S.'s National Earthquake Information Center Web site [<http://neic.usgs.gov>] for everyone to see. All data collected is posted from all over the world. Each occurrence is categorized and commented on, and has a map showing the epicenter, the depth of the quake, and its magnitude. Rock on, planet.

From The Modulator, the news and views of the Fort Myers Amateur Radio Club, Inc., Jan. 2003.

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NEVER SAY DIE

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article may have been more aimed at hurting their competition for senior attention than enlightening the readers.

The AMA vs. Cancer

At an average of \$345,000 per patient, cancer is a huge business. If it has touched your life, either personally or through a family member or friend, isn't it worth spending a little time to learn more about it?

For instance, you'll learn that only about 7% of cancer patients achieve a remission. In 15% of the cases the patient's life is marginally prolonged. A "cure" is when a patient lives for five years.

With a 93% sentence of death, no wonder cancer scares the hell out of us.

When Dr. Richeard Eby, a well-known medical leader, went to the AMA and asked why they hadn't done any research on primitive societies where the people have no cancer, he was told by the AMA's chief counsel that the purpose of the AMA, if he'd read the by-laws, was to protect the income of its members. And since their biggest income

was from cancer patients, if ever a cure for cancer was found this could eliminate their main income. So, the AMA would make sure that no cancer cure was found or allowed to be recognized in America. Period. Further, donations (bribes) to Congress would make sure that the FDA supported the AMA policy.

And you thought I was a wacko for insisting that there's a simple no-drug cure for cancer that the AMA has been covering up. It's explained in my *Secret Guide to Health*.

Health Cost Strikes

The continually rising health care costs, now in double digit jumps, mainly caused by ever higher prescription prices, is increasing the cost of health care insurance by about \$500 this year. When General Electric balked, asking employees to pay a higher share, the workers went on strike.

I wonder what would happen if G.E. were to distribute my *Secret Guide to Health* to all their employees? I'll bet it would cost the company a lot less than a strike. I'll give 'em a special bulk discount.

Rotten Saddam

Can it be that we've been lied to? Again? By our own government? Say it isn't so!

If you missed the *Coast-to-Coast* show with Joyce Reilly interviewing one of the group of Americans who set the Kuwait oil well fires, you probably still believe that nasty rotten Saddam's guys did it. Nope, he says they were all set by our special forces to demonize Saddam. If so, it sure worked as planned.

And how about the reports leaking out that the poison gassing of the Kurd villages was actually done by the Iranians, complete with follow-up camera crews flown in to report on the atrocity.

Who knows what to believe? Well, one thing we do know: We can't believe our government or the media. So, where do we turn? Well, other than *Coast-to-Coast*?

I'm exaggerating? Then you haven't read *Into The Buzzsaw*, which documents one major cover-up after another. Like what actually happened to Flight 800.

No, Saddam is (was?) not a nice guy, but we've probably been suckered by the propaganda meisters again.

Continued on page 9

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LETTERS

From the Ham Shack

Gene Collins KA2IWJ, Tonawanda NY. I agree 100% with the "immigrants" section of your March editorial! I've been complaining about this for many years — especially the "Afro-American" bit. Most of these people are no more African than I am. Anyway, I just wanted to let you know you've got the right combination of words there. Also, it annoys me that the US government will supply documents in Spanish. State ballots in Spanish also annoy me.

By the way, on your recommendation, I bought and read the book *Day of Deceit* by Robert B. Stinnett. I found it most interesting. It now resides in my very limited World War II library. I was only three years old when Pearl Harbor was attacked, but I remember rationing coupons, air wardens (drills with the lights out), and other assorted things.

Gene Blum KD5DGA. I was given about 5 years' worth of your 73 magazines from a friend of mine whose father has a subscription. The dates range from early part of 1997 to late part of 2001. I took them because of my interest in information about ham radio. I was so amused when I started looking through these magazines and saw the wealth of information that really blows away *CQ* and *QST*. I noticed that you cut away the bullshit and went for the meat and potatoes. I really enjoyed reading all the articles. I really was amazed about your editorials that you write. Who cares what the few say about what you have to say what is on your mind? I am, however, disappointed that 73 can't be found at any bookstore. I would like to start a subscription to 73 and enjoy (to me) the very best in ham radio publications.

Dan Clark W9VV. After reading the 7-page article in the March issue on how to build a telegraph key, I have to ask, What ever happened to radio? I don't believe many hams are going to rush to their basements to build a telegraph key from this article. How many hams have lathes, milling machines, drill presses and dial test indicators to build a key from an article like this?

The article is well done, and the key is a nice piece of work. However, I think a 7-page article like this would be better suited to *The Model Engineer* magazine or another publication dedicated to miniature machining.

If you are having difficulty getting articles

on subjects that are more related to radio communication, I have a suggestion. RECYCLE! Long ago, 73 had all kinds of great articles on the subject, many of which are still relevant today. With articles first published in the 1960s, consider that there have been two generations of hams who have never seen them. The older guys who did see them (like me) may not remember them. So to a large ham population, the articles will seem like brand new.

I don't suggest you reprint articles on vacuum tube technology, and I think we can rule out articles on surplus equipment conversion. However, there are many articles on easy-to-build transistor projects that could be recycled. Antennas haven't changed much in 40 years, and hams still build them, so how about reprinting some of those articles. Basic theory on how things work still can be useful to recent generations of hams. Cartoons and humor articles are other possibilities for recycling.

Reaching down towards the bottom of the pile, I came up with several issues of 73 from 1962. From March of that year there was a short article on checking transistors with an ohmmeter. The Zero Beatnik was an article on building a one-transistor oscillator that was used as a radiating BFO for receivers not equipped with one.

From April of there was The 40-meter ZL Special antenna made of twinlead. LCU's Michigan Long Wire was a temporary 75 meter antenna made of twinlead. The Universal Antenna article described a 70 ft. wire antenna loaded on several bands with an L network.

May had articles on a simple antenna mast for Field Day, an article on silicon rectifiers, and also a descriptive article on four-layer diodes (SCRs). Your competition has published basic articles on emitter follower amplifiers and also resistors and inductors in their March 2003 issues. So there must be some need for basic theory articles.

There appeared many short half-page articles on hints on how-to-do-it in past issues. Some were off the wall, but many were useful. Most all were interesting. Many of these could be reprinted. Who knows, some who read them might be inspired to contribute some new ones.

Many of the articles could be recycled with little or no editing to bring them up to date. I can suggest many possibilities to you if you have any interest. Just think, recycled articles are all paid for!

I believe that selectively recycling articles from long ago is not just a trip down memory lane, but it is something that could provide useful and interesting material to fill the pages of 73. What say, Wayne?

I say thanks for taking the time to write this letter. As a matter of fact and coincidence, there may be some 1975 log periodicals about to show up in your backyard. Now get back to that article you were writing, OK? And ... what do the rest of you want to see in 73? — Wayne.

From "Dave." I have been licensed and a subscriber for over a year. I note that you are interested in having more people in the hobby.

I do not have a radio yet because I have no idea what I should get as a beginner. I'm sure that there are others like me. How about an article on how to get started? I would like to have some idea about what is an appropriate rig for me to start with. Preferably something I can enlarge. Thanks!

So who out there is going to get off his duff and let us pay him (or her!) for the above mentioned article? — Wayne.

Frank Rumph KD4DZI. I built a bioelectrifier which works good for me. You've been saying to build a pulser to go along with it. I was looking for a flash unit and my son Donald N2LDY suggested I get one of those disposable cameras. I went to Walgreen's where they develop the pictures, and they had a garbage can full. I got several for free.

It's a simple matter to cut the land on the board and splice in the wire for the coil in series with the flash tube.

You can cut a hole in the back of the case to rotate the film sprocket and set the camera. Press the picture button and the flash goes off.

I don't get why Beck said to use such heavy wire (#14) for the coil.

Jack Botsford W0JAC. I just sent my renewal for 73 mag. Wayne, your editorials are the highlight of the month. I look forward to reading them first and I almost always agree with you — please keep it up.

Your accounts of WWII bring back a few things that I do not like to remember, like the radio room on a supply ship. At night it

Continued on page 62

NEVER SAY DIE

continued from page 7

Never Learning

The French seemingly learned nothing from their disaster in WWII. They "gave peace a chance" in 1938 when they violated their mutual defense treaty with Czechoslovakia and gave the western part of that country to Hitler at Munich.

Then, a year later, when they were formally at war, while Hitler was invading Poland, and France had a huge military superiority on its border with Germany, they sat there doing nothing for over six months. This gave Hitler time to move his army from the East back to the western front and attack France. France surrendered in only six weeks. Four years later Allied troops landed at Normandy and took their country back for them.

Now we see France dithering again, "giving peace a chance." What a bunch of losers! Their cheese stinks, too.

Let's Vote

What do you think was the greatest cover-up of the 20th century? My list of candidates includes (1) the discovery that any illness can be cured with no drugs; (2) the government's capturing crashed UFOs, communications with ETs, and the integration of some of their technology into ours; or (3) the faked Moon landings thirty years ago?

There are a host of lesser cover-ups ... like the fluoride in our water to make us docile, mercury poisoning from amalgam fillings, illnesses caused by root canals, vaccinations, the intentional depopulating of Africa with AIDS, President Roosevelt planning the Pearl Harbor attack, the downing of Flight 800 cover-up, who owns the major media, who controls Congress, and so on. It's a long list.

Okay, what, in your mind, was the most egregious cover-up of the 20th century?

Alzheimer's

The cover story in the March 15th issue of *Bottom Line* was on Alzheimer's. Since my mother had this terrible disease, I have a special interest in it.

Considering how awful (and expensive) this disease is, and that 10% of seniors are going this slow route to the grave, there's much to be said for not contributing early on to the disease. And that's when it starts.

So? The article says that the disease develops over decades and that diet seems to have a lot to do with it. Hey, gee, wow! — is that a big surprise. What's recommended? Lots of citrus

fruits, strawberries, tomatoes, vegetable oils, nuts. A raw food diet! By golly, that's just what I had for breakfast this morning! I had a grapefruit, strawberries, and orange. My mid-morning "snack" is an ounce of flax seed oil, a vitamin-mineral supplement mixed in apple juice, some cottage cheese and a glass of red grape juice. For lunch, I had melon, orange, and banana.

Since Alzheimer's patients brains are caked with aluminum, what's the harm in doing your best to keep your aluminum intake to a minimum? You shouldn't be eating any cooked food if you have much of an interest in having a healthy old age, but if you are still addicted to such poisons, at least don't cook the stuff in aluminum pans.

Then there are vaccinations, which are loaded with both mercury and aluminum. And deodorants (read the labels), which migrate aluminum through your skin and up to what's left of your brain.

Once you're an Alzheimer veggio you'll be sitting in a nursing home, strapped to a rocking chair so you won't wander off and get lost. You'll have no memory of anything recent, even from minutes ago. The only person my mother recognized was me. Not even my father. She did remember the address where she lived in Denver when she was eight years old, but very little more recent.

It's something to think about the next time you order a hamburger, fries and a diet Coke.

The Saudis

An E-mail pointing out that the Saudis are now boycotting American products

Continued on page 36

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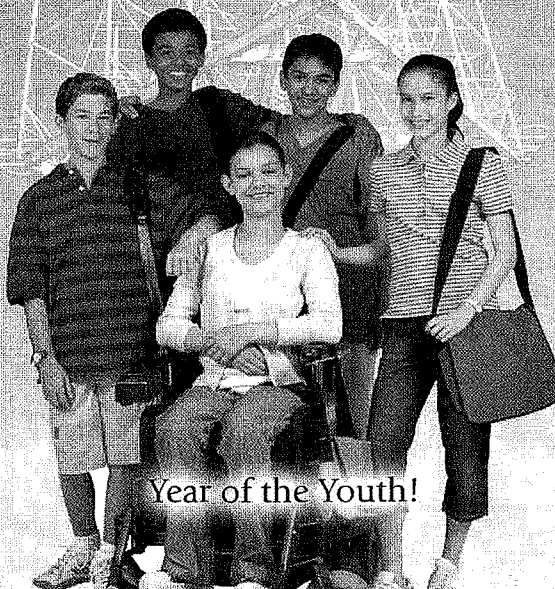
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Year of the Youth!

Tunable Broadcast Band Filter

Another great project from K8ZOA.

I recently built a tunable bandpass filter for the AM broadcast band and learned a great deal about the quirks of tunable filters. The concepts and design philosophy behind my design are easily extensible to other frequencies using the techniques developed below.

Usually, filter design is approached with a set of design requirements in hand, such as passband width or required rejection attenuation at specified frequencies. Based on these requirements, the designer selects the mathematical model that governs the filter design — Butterworth, Chebychev, etc. — and determines the number of elements required to meet these requirements. The component values are then calculated. Or, these steps can be automated with computer software to completely design the filter, including a schematic, parts

values and simulated performance graphs.

My design proceeded in a bit of an inside-out direction — I had a 3-section variable capacitor and wanted to build a tunable broadcast band filter based around it. I had originally toyed with a permeability-tuned approach, with ferrite slugs moving in or out of coils, as implemented by Collins in its famous R390/390A general coverage receivers. A couple of test coils quickly convinced me that I couldn't wind coils that tracked closely enough.

Although my particular design was

for the broadcast band, it's easy to modify the design for other frequencies — for example, as a pre-selector for a 3.5–4 MHz direct conversion receiver. (A filter used between the antenna and receiver is sometimes called a "pre-selector.")

It's possible to design a filter without pencil or paper; enter a few values into a filter design program and out comes a complete design. Although great timesavers, automatic design programs frequently hide critical details and design trade-offs. Hence, this article concentrates on a step-by-step manual design. Along the way, we will see that significant adjustments to theoretical designs are necessary.

Choice of coupled resonator filters

Recent ARRL handbooks devote a chapter to filters, including designing band-pass filters based upon a low-pass prototype. Unfortunately, a simple transform, as shown in **Fig. 1** is difficult to implement as a tunable filter; if our tuning element is to be a variable capacitor one of its sections must float above ground. A standard multisection variable capacitor is therefore unusable, as each section has one grounded

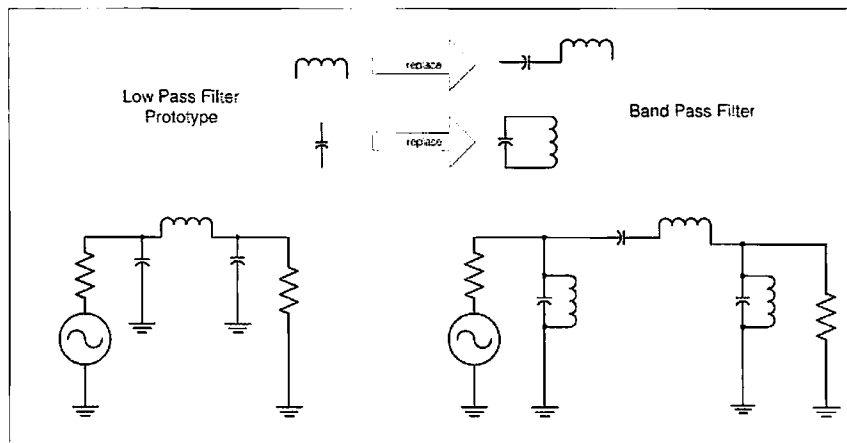


Fig. 1. Conventional transformation of low pass prototype to bandpass filter.

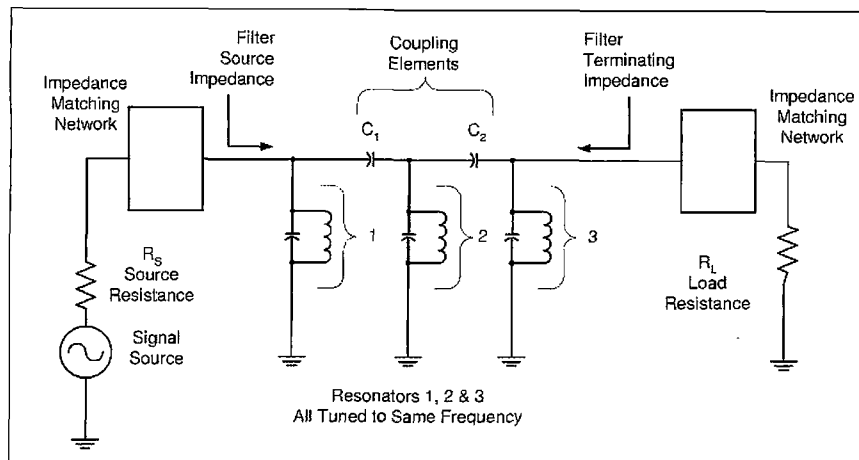


Fig. 2. Conceptual coupled resonator filter.

side. The floating inductor causes further implementation troubles, as stray capacitance to ground may be an issue. We've already ruled out variable inductance tuning, so an alternative topology is necessary.

A coupled resonator design, as shown conceptually at Fig. 2, solves many problems found in the design of Fig. 1; the main tuning capacitor elements have one side grounded as do all inductors. So far, so good. The most serious difficulty is that the coupling capacitors C_1 and C_2 must float above ground. Worse yet, as we will discover, both C_1 and C_2 must vary as well as the resonator tuning capacitors in a wide range tunable filter. Fortunately, these are small value capacitors and can be floated with only moderate difficulty. (A wonderful variety of alternative coupling possibilities exist, but for a variety of implementation issues, capacitive top coupling works the best for a wide range tunable design.)

Section 1 — Design

We'll design our tunable filter by looking at a series of designs for fixed frequencies throughout the tuning range. We'll find that our design will call for a number of compromises.

Our design requirements are to tune the AM broadcast band (535–1705 kHz) with reasonable selectivity, and an inductor Q that can be easily achieved in a home workshop. Limitations on inductor Q dictate our choice of a Butterworth prototype design.

We'll start our design at 550 kHz, near the bottom of our desired tuning range. At this frequency, we would like sufficient bandwidth to pass an AM broadcast signal without significant attenuation of the sidebands. We also can't make the filter bandwidth arbitrarily small without causing tracking and other problems. Accordingly, we'll use 20 kHz as our desired bandwidth.

Step 1 — Summary of design criteria

- 3 dB bandwidth at 550 kHz = 20 kHz (Upper 3 dB point is thus 560 kHz, lower 3 dB point is 540 kHz)
- Inductor Q_0 approximately 200
- Tuning capacitor range 375–14 pF (3 sections)
- Input & Output Impedance = 50 ohms
- Tuning range 540 kHz to 1700 kHz
- Filter design is Butterworth
- All capacitors are assumed lossless

Order	q1	qn	k12	k23	k34	k45
2	1.4142	1.4142	0.7071	—	—	—
3	1.0000	1.0000	0.7071	0.7071	—	—
4	0.7654	0.7654	0.8409	0.5412	0.8409	—
5	0.6180	0.6180	1.0000	0.5559	0.5559	1.000

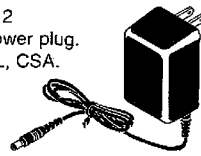
Table 1. Butterworth bandpass filter coefficients for orders 1 ... 5.

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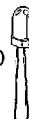
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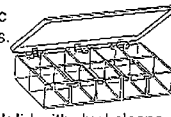
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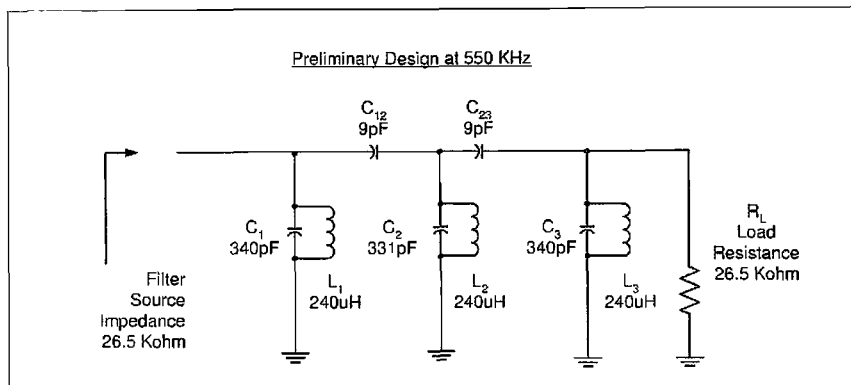


Fig. 3. Preliminary design at 550 kHz.

Step 2 — Calculate fractional bandwidth and resonator inductance

Fractional bandwidth, "a":

$$a = \frac{f_m}{\Delta f} = \frac{\sqrt{f_{3dBupper} \times f_{3dBlower}}}{f_{3dBupper} - f_{3dBlower}}$$

f_m is the geometric mean frequency, or

$$\sqrt{540 \text{ kHz} \times 560 \text{ kHz}} = 549.91 \text{ kHz.}$$

Since our filter is relatively narrow band, f_m is approximately the arithmetic center frequency, 550 kHz, and we'll use $f_m = 550$ kHz in our calculations.

Δf is the 3 dB bandwidth.

The fractional bandwidth is thus $a = 550 \text{ kHz} / 20 \text{ kHz} = 27.5$.

Now we will calculate the required resonator inductance based upon our maximum tuning capacitance, using

the standard formula for a resonant LC circuit. To ensure that we can tune down to the bottom of the broadcast band, we will assume that only 350 pF is available at 550 kHz, instead of the maximum 375 pF.

$$f = 1/2\pi\sqrt{LC}, \text{ or, solving for } L, L = 1/(2\pi f)^2 C$$

Remembering that C is in farads and that 1 pF is 10^{-12} farads, f is in hertz, and 1 kHz = 1000 Hz, we determine the required resonating inductance L, in henrys:

$$L = 1/(2\pi \times 500 \times 10^3)^2 350 \times 10^{-12} = 1/11.94 \times 10^{12} \times 350 \times 10^{-12} = 239 \times 10^{-6} \text{ H or } 239 \mu\text{H}$$

We will round L up to 240 μH .

We will now check whether our maximum frequency is achievable. We can assume that an air-wound solenoid form 240 μH inductor of reasonable size will have around 5 pF of distributed capacitance, and that wiring strays will add another 3 pF. We can also estimate the coupling capacitors as adding another 2 pF when set for 1700 kHz. Thus, our minimum capacitance is 14 pF + 5 pF + 3 pF + 2 pF = 24 pF. Using the LC resonance formula, we can determine the required C for resonance at 1700 kHz with 240 μH .

$$C = 1/(2\pi f)^2 L = 1/(2\pi \times 1700 \times 10^3)^2 \times 240 \times 10^{-6} = 36.5 \times 10^{-12} \text{ F or } 36.5 \text{ pF}$$

Our choice of 240 μH should work at 1700 kHz, with the tuning capacitor slightly less than fully unmeshed.

However, we should be concerned that strays and self-capacitance amount to 8 pF of the total 36.5 pF. Strays and self-capacitance are notoriously difficult to control and suggest that we may experience trouble keeping all nodes tuned to the proper frequency as we approach 1700 kHz.

Step 3 — Un-normalize filter coefficients

Table 1 has the normalized Butterworth bandpass filter coefficients for 2 through 5 resonator filters. (I calculated Table 1's values myself using the formulas provided in the sidebar "How to Make a Butterworth Low-Pass and Band-Pass Table." References [1] and [2] have similar tables.)

Table 1's values assume no losses, i.e., that our components have infinite Q. This is not the case, and we can either proceed with the understanding that our filter will not exactly meet our performance calculations, or we may use "predistorted" filter coefficients that take into account component losses. Compared with the infinite Q design, finite component Q increases the insertion loss, causes the shoulders of the pass-band to slump and reduces the stop-band loss. We will use the infinite Q table and accept any corresponding divergence between theory and design. References [01] and [02] provide both lossless and pre-distorted design tables, should the reader wish to pursue a more refined design. Both references provide similar tables for a variety of other filter responses, including Chebychev, Gaussian, linear phase, etc.

For a three-resonator design (N = 3), Table 1 provides the following normalized values:

$$\begin{aligned} q_1 &= 1.000 \\ q_n &= 1.000 \\ k_{12} &= 0.7071 \\ k_{23} &= 0.7071 \end{aligned}$$

These are "normalized" values, based upon $a = 1.000$. " q_1 " and " q_n " refer to the loaded Q of the input (first) and output (the "nth") resonators, k_{12} refers to the coupling between resonators 1 and 2, k_{23}

Parameter	Tuning Frequency		
	550 kHz	970 kHz	1700 kHz
Input impedance (k ohms)	26.5	46.6	81.5
Output impedance (k ohms)	26.5	46.6	81.5
"a" factor	27.5	27.5	27.5
Bandwidth (kHz)	20	35	62
$L_1, L_2, \& L_3$ (μH)	240	240	240
C_{12} (pF)	9	2.9	0.94
C_{21} (pF)	9	2.9	0.94
C_1 (pF)	340	109.3	35.6
C_2 (pF)	331	106.4	34.6
C_3 (pF)	340	109.3	35.6

Table 2. Preliminary design component values.

the coupling between the 2nd and 3rd resonators, etc. Our filter design has a = 27.5, so we must "de-normalize" the **Table 1** parameters. To de-normalize, q values are multiplied by a; k values are divided by a:

$$Q_1 = aq_1 = 27.5 \times 1.000 = 27.5; Q_3 = aq_n = 27.5 \times 1.00 = 27.5$$

$$K_{12} = k_{12}/a = 0.7071/27.5 = 0.0257; K_{23} = k_{23}/a = 0.7071/27.5 = 0.0257$$

(We will refer to normalized values with lower case letters and de-normalized values with upper case.)

Step 4 — Calculate nodal capacitor, coupling capacitors, and tuning capacitors

At 550 kHz, our nominal 240 μ H inductors require 348.9 pF for resonance, determined by the standard resonance formula

$$C = 1/(2\pi f)^2 L$$

We now calculate the coupling capacitors. In our preliminary design, all inductors are 240 μ H, and therefore each of the three resonating nodal capacitances, C_N , is 348.9 pF.

The coupling capacitor between nodes j and k, C_{jk} , is equal to the product of C_N and K_{ij} .

$$C_{12} = C_N \times K_{12} = 348.9 \text{ pF} \times 0.02571 = 8.97 \text{ pF}$$

Likewise, we can calculate $C_{23} = 8.97 \text{ pF}$.

We can now calculate the tuning capacitors C_1 , C_2 , and C_3 needed for resonators 1, 2, and 3. To do this, we mentally short to ground the adjacent nodes and determine the total capacitance across the resonator.

Resonator 1 therefore "sees" its tuning capacitor C_1 , and coupling capacitor C_{12} . Resonator 2 "sees" its tuning capacitor C_2 , and two coupling capacitors, C_{12} and C_{23} . Resonator 3 "sees" its tuning capacitor C_3 and coupling capacitor C_{23} . We now can determine C_1 , C_2 and C_3 :

$$C_1 = C_N - C_{12} = 348.9 \text{ pF} - 8.97 \text{ pF} = 339.9 \text{ pF}$$

$$C_2 = C_N - C_{12} - C_{23} = 348.9 \text{ pF} - 8.97 \text{ pF} - 8.97 \text{ pF} = 331 \text{ pF}$$

$$C_3 = C_N - C_{23} = 348.9 \text{ pF} - 8.97 \text{ pF} = 339.9 \text{ pF}$$

Step 5 — Driving and load impedance

The final step in our preliminary design is to determine the filter's driving point impedance R_s and its load impedance R_L .

We have previously determined the de-normalized loaded Qs, Q_1 and Q_3 , associated with the input and terminating resonators. We now can determine the equivalent parallel resistance, R_p , for the two end resonators, remembering that the Q of an inductor is given by

$$Q = R/X_L = R/2\pi fL,$$

where R is in parallel with the inductance. The input resonator's parallel loading resistor, R_{p1} is thus:

$$R_{p1} = 2\pi fLQ_1 = 2 \times 3.14159 \times 550 \times 10^3 \times 240 \times 10^{-6} \times 27.5 = 22.8 \text{ k}\Omega$$

R_{p1} actually consists of two parallel resistances: the driving-point resistance R_s and the parasitic resistance of the inductor, R_x , due to its finite Q.

$$R_x = 2\pi fLQ_1 = 2 \times 3.14159 \times 550 \times 10^3 \times 240 \times 10^{-6} \times 200 = 166 \text{ k}\Omega$$

Using the standard formula for parallel resistances, we know that

$$R_{p1} = (R_s \times R_x)/(R_s + R_x)$$

Solving for R_s :

$$R_s = (R_{p1} \times R_x)/(R_x - R_{p1}) = (166 \text{ k}\Omega \times 22.8 \text{ k}\Omega)/(166 \text{ k}\Omega - 22.8 \text{ k}\Omega) = 26.5 \text{ k}\Omega$$

Likewise, $R_L = 26.5 \text{ k}\Omega$.

Fig. 3 shows our completed preliminary design at 550 kHz. It will need substantial modification to be practicable.

Changes for constructability

Since we are building a *tunable* bandpass filter, we must know how all of the filter parameters vary with frequency. **Table 2** shows component values for the lowest and highest design frequencies and the geometrical midpoint frequency.

Note that we've kept "a" constant and allowed the bandwidth to increase

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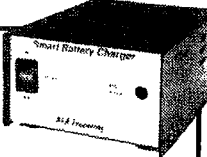
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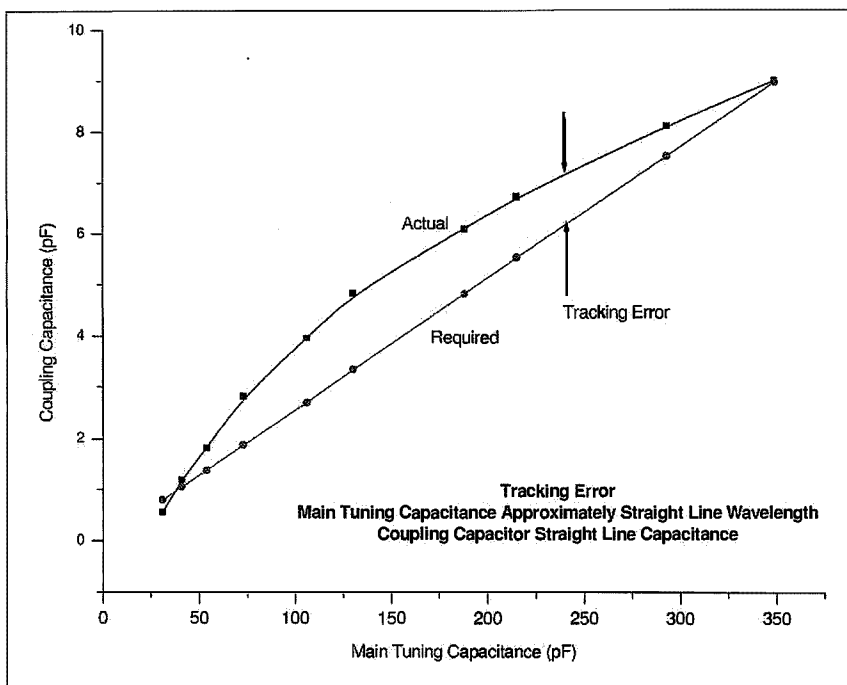


Fig. 4. Tracking error between main tuning and coupling capacitors.

with increasing frequency. If we try to maintain a constant bandwidth of 20 kHz at 1700 kHz, we quickly will find that we need a much higher Q inductor — on the order of 1000 or more — that C_{12} and C_{23} become a few tenths of pF and that the input and output impedances soar to hundreds of thousands of ohms. Hence, we will accept increasing bandwidth with frequency.

Four problems immediately spring to light in Table 2.

- How do we match to 50 ohms input/output?
- How do we deal with C_2 being smaller than C_1 and C_3 ?
- How do we vary the coupling capacitors in synchronization with C_1 , C_2 , and C_3 ?
- How do we make the coupling capacitors a more reasonable value?

Matching input and output

We desire the filter to have a 50 ohm input and output impedance; our design

shows the filter is a much higher impedance device. Hence, we must match both the input and output to 50 ohms. Since our filter tunes over a 3:1 range, we must immediately discard narrow-band matching. The classic reference *Single-Sideband Systems & Circuits* notes that input and output matching of a coupled resonator filter over a wide frequency range “can tax the ingenuity of the designer.” If anything, this is an understatement.

The most obvious matching method is to use the input and output inductors as autotransformers by tapping the feedpoint near the grounded side. If the inductor has N total turns, tapping n turns from the ground end produces an impedance step-up factor F of $F = (N/n)^2$, neglecting leakage flux. Since the impedance to be matched varies from 26.5 k-ohms to 81.5 k-ohms, a single tap point will cause a mismatch at some frequencies. We will design the tap for a match at the lowest impedance, accepting the consequences of a mismatch at other ranges. (This decision loads both the input and output resonators more heavily than our design calls for at higher frequencies, so we expect to see some additional bandwidth spreading.)

Accordingly, we need an impedance step-up factor of $26500/50 = 530$.

L1 and L3 have 75 turns, so $N = 75$. We now can find the tap point:

$$n = N/\sqrt{F} = 75/\sqrt{530} = 3.25$$

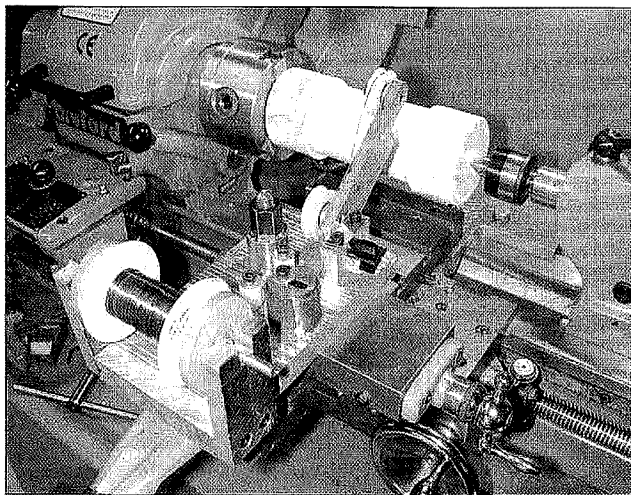


Photo A. I wound the coils on a lathe with a homemade winding adaptor.

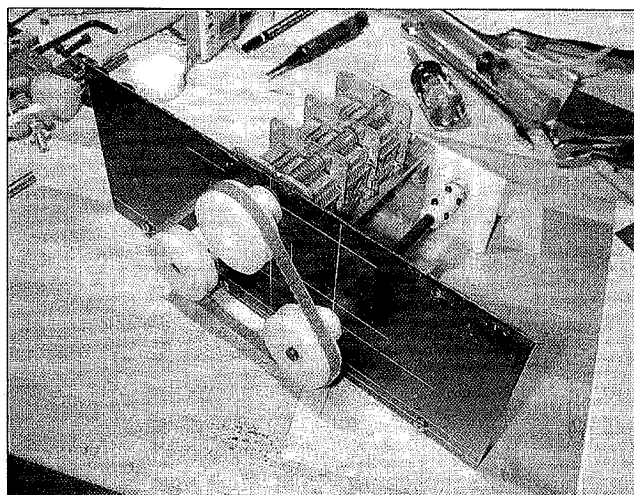


Photo B. The three variable capacitor shafts are ganged with a toothed belt and pulley arrangement.



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We will tap at 3-1/4 turns from the ground end of L_1 and L_3 .

C_2 not equal to C_1 and C_3

C_2 is smaller than C_1 or C_3 by the coupling capacitor value. We could physically modify one section of the three-section tuning capacitor by bending a plate, or possibly even removing a plate. However, we note that C_2 is a constant percentage smaller than C_1 or C_3 through the tuning range. (C_2 is 97.35% of C_1 or C_3 .) This suggests that we can instead slightly reduce L_2 and use a uniform tuning capacitor where $C_1 = C_2 = C_3$. If we use a uniform tuning capacitor, C_2 will be 1/0.9753 too large. Since the resonant frequency of a tuned LC circuit is proportional to the product of L and C , we should reduce L_2 to 97.53% of L_1 or L_3 .

$$L_2 = 0.9753L_1 = 240 \mu\text{H} \times 0.9753 = 233.6 \mu\text{H}$$

Our new L_2 should be 234 μH .

How to vary C_{12} and C_{23} in concert with C_1 , C_2 and C_3

As we have determined, the coupling capacitance is directly proportional to the tuning capacitance, via K_{12} and K_{23} . Conceptually, therefore, we can mechanically link the shaft of the main tuning capacitor and two small variables. As the tuning capacitance is increased or decreased, therefore, a corresponding change is made to the coupling capacitors.

Here we run into another snag. Almost all small variables are "straight line capacitance," i.e., the capacitance varies linearly with shaft rotation. Most high-capacity broadcast receiver-type variables, such as the one we will use for tuning, are straight-line

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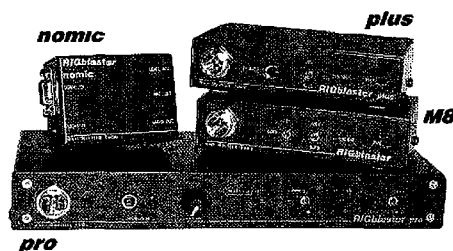
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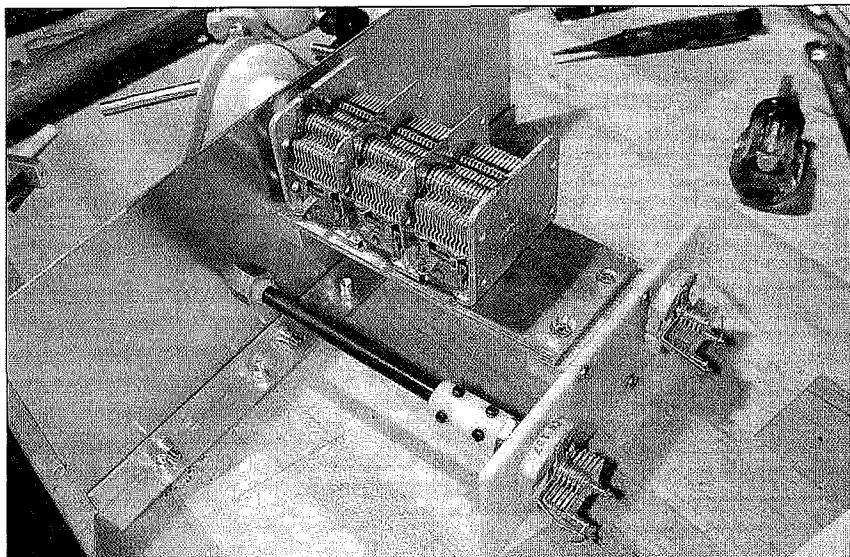


Photo C. Mount the variable coupling capacitors on an insulating plate as both sides are above ground.

wavelength. Hence, although we may be able to align the tuning and coupling capacitors at full mesh and open mesh, there will be a tracking error at intermediate points, as illustrated at **Fig. 4**. We could also reduce the mean error by shifting the actual capacitance curve downward, such as by adding a fixed series capacitor, thereby causing the error to be a mix of over- and undercoupling.

Unfortunately, there is no simple fix to the tracking error problem. What we

need are tuning and coupling variables with a similar tuning characteristic. Or, we might synthesize the desired tracking through a cam or other mechanical contrivance. Here, we will instead accept the tracking error. Since the coupling is heavier than desired, we anticipate that the filter bandwidth will exceed our design objectives in the midband.

The coupling capacitor complexity stems directly from our filter being tunable over nearly two octaves. If our

filter needed to cover only a single ham band, C_{12} and C_{23} could be fixed capacitors designed for the middle of the band. Only slight error would result at the band edges.

Making the coupling capacitors reasonable value

Although a 9 pF coupling capacitor at 550 kHz isn't an unreasonable value, there are obvious difficulties posed to provide 0.94 pF for 1700 kHz. Stray wiring capacitance, and the inevitable minimum capacitance of small variables, make realizing sub-pF capacitances difficult.

Fortunately, we can use the tapped inductor transformer to increase the required coupling capacitance. As illustrated in **Fig. 5**, a transformer will multiply (or divide) the effective capacitance by N^2 . If, instead of connecting the coupling capacitors to the top of the inductor, we connect to a tap at one-half the number of turns, we increase the required coupling capacitors by a factor of 4. Thus, we require two variables with $C_{\max} = 36$ pF and $C_{\min} = 3.6$ pF, much more reasonable values.

Fig. 6 shows our final "implementable" design.

Section 2 — Construction

It's unlikely that anyone would wish to exactly duplicate my mechanical configuration, so I won't provide detailed layout dimensions. But, the photographs should help you modify my ideas to work with your particular parts.

Winding the inductors

The resonator inductors must have reasonably high Q (preferably exceeding 200) and should be matched within 1% or so. (L_2 being matched as 97.5% of L_1 and L_3 .) The absolute value isn't nearly as critical and could vary $\pm 5\%$.

Although toroid inductors would save space, achieving our Q target would be difficult. Further, matching three toroid inductors to 1% would be difficult, as core-to-core variations of 20% are not uncommon.

I therefore decided to wind three single-layer solenoid coils. I used a

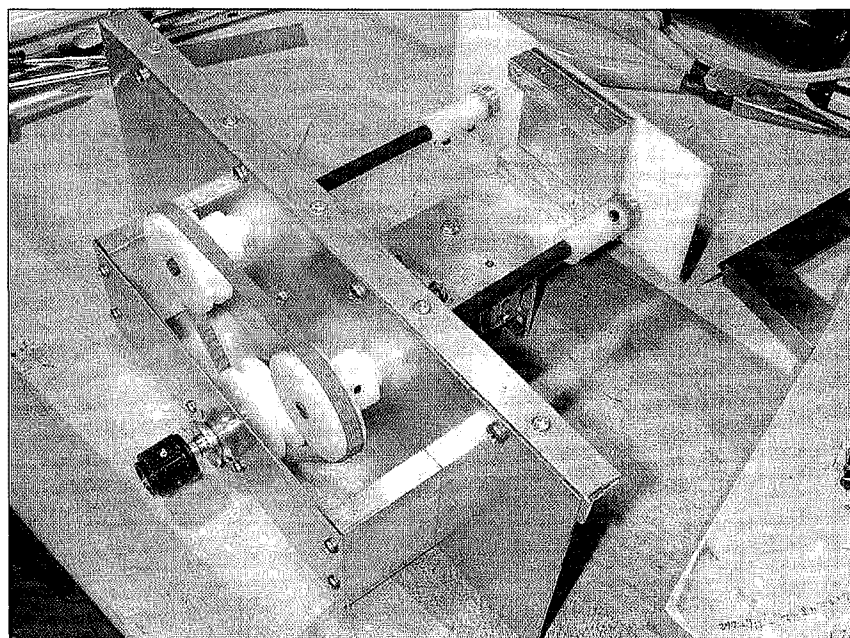


Photo D. The main shaft is driven with a 6:1 reduction vernier.

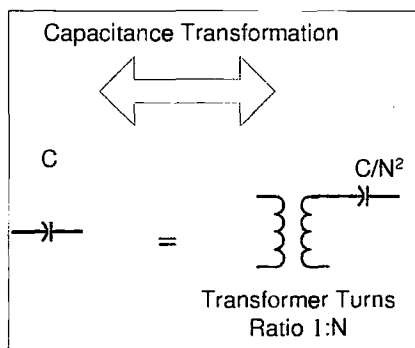


Fig. 5. A transformer can multiply or divide a capacitor's value.

homemade coil winding adapter and a lathe, but hand winding should be possible with reasonable care. My coils were wound on 5-1/2-inch lengths of 2-inch schedule 40 PVC pipe, with an outside diameter of 2-3/8 inch. I wound L_1 and L_2 with no. 24 AWG magnet wire, at 32 turns/inch. I used no. 22 AWG magnet wire for L_3 . The windings occupy about 2-3/8 inch of the core.

L_1 required 76 turns for 243 μH . L_2 required 72 turns for 236 μH . L_3 required 74 turns for 239 μH . In all cases, I wound the coils with 80 turns and removed a turn at a time until I reached the desired inductance.

These inductors have an indicated Q between 200 and 230. I measured the distributed capacitance of L_1 and L_2 at 2.5 pF and L_3 at 5.5 pF. This additional distributed capacitance is an offset for the slightly lower inductance of L_3 (L_3 being wound with larger wire, has closer turn-to-turn spacing resulting in increased distributed capacitance.)

A brief mention of distributed capacitance may be in order. Terman's *Electronic and Radio Engineering*, 4th ed., succinctly states the cause of distributed capacitance in coils:

"In a coil there are small capacitances between adjacent turns, between turns that are not adjacent, between terminal leads, between turns and ground, etc. ... The total effect that the numerous small capacitances have can be represented to a high degree of accuracy by assuming that they can be replaced by a single capacitor of appropriate size shunted across the coil terminals."

Distributed capacitance sets a limit on the highest frequency at which a coil may be resonated; with no additional capacitance, the inductance and C_{dist} parallel resonate at some frequency, referred to as the "self-resonant frequency," or F_{self} .

Although I used an HP-4342A Q-meter to match my inductors, almost any method may be used, as we are chiefly looking for relative accuracy. For example, with a fixed 370 pF capacitor in parallel across L_1 , remove turns until a grid dip meter indicates resonance at 534 kHz. Move the 370 pF capacitor to L_3 and remove turns until a dip is seen at exactly the same dial point as observed for L_1 . Move the 370 pF to L_2 and parallel it with a 10 pF capacitor. Remove turns from L_2 until L_2 dips at the same dial point as seen with L_1 and L_3 . You can also squeeze the turns or spread them out to fine tune the inductance. (Since we are matching all inductors to the same dial mark, each inductor will be matched. If the grid dip meter dial is within 5%, the absolute value of the inductors will be close enough.)

I do not recommend using small pre-wound inductors, such as the 10 mm Toko or Coilcraft series, as their Q is well below minimum acceptable values for good performance.

Linking the variable capacitors

I mechanically ganged the main tuning capacitor and the two coupling

variables with a miniature toothed drive belt and pulleys. To slow down the tuning, I used a 6:1 vernier reduction drive. The vernier drive is connected to the main tuning capacitor with the two coupling variables being driven via the drive belt. The drive belt is approximately 12 inches in circumference.

Since both sides of the coupling capacitors float above ground, they must be mounted on an insulating material. I used 1/8-inch-thick Delrin® plastic. The shaft extension should also be insulated: I used 1/4-inch fiber rods.

I turned the pulleys on a lathe from 1-1/2-inch-diameter Delrin rod. I also made Delrin shaft bushings for the two 1/4-inch drive shafts.

The completed tuning assembly is reasonably smooth, but has a slight degree of "springiness" due mostly to flexing of the 1/4-inch shafts. The tuning feel could be improved — at the expense of considerable added mechanical complexity — by adding outboard bearings so that the shafts experience no significant bending moment. Some ultimate limit on tuning smoothness will be imposed by the drive belt stretch.

Because I wanted to use a large circular dial, it was necessary to elevate the main tuning capacitor with a bracket assembly. The mechanical assembly is further complicated by my desire to build and test the filter in

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sections. Thus, I made the capacitor tuning assembly as a stand-alone unit, for later installation into an enclosure. Some simplification would be possible if stand-alone testing was not desired.

If you wish to greatly simplify the mechanical portions of this project — and the mechanical elements represent 90% of the total effort — it isn't necessary to gang the main tuning with the coupling variables. Instead, tuning will require setting three knobs, not one. An additional side benefit is that the main tuning and coupling controls can be individually calibrated thereby removing tracking error.

Construction, layout, and wiring

I decided to make a completely homemade enclosure from sheet aluminum. The base is a 12" x 12" x 1/8" sheet. The front, back, and side panels are 12" x 8" x 0.050". The top is 12" x 12" x 0.050". All panels are held together with odds and ends of aluminum stock, mostly 1/2" x 1/2" bar stock and 1/2" angle. I painted the enclosure with primer and a finish coat of gloss dark gray.

The size of my enclosure was driven by the size of the coils and my desire not to have any inductor wiring one inch of the chassis in so far as possible, although I did not fully meet this objective in all cases.

I made the dial from a piece of 1/8-

inch white Lucite® plastic. I marked out a 6-inch-diameter circle with a compass and then rough cut it with a scroll saw. I then turned it to a perfect circle in the lathe. A lathe isn't necessary, as with some finishing with a file would have produced quite acceptable results if the scroll saw work were done carefully.

Start with a simple 0–100 scale taped to the dial and record the frequencies that corresponded to the major divisions. Then use a computer drawing program to prepare the scale and print it in reverse on a clear plastic sheet of the type used for an overhead projector. (I used Visio®.) Glue the scale to the Lucite backing with a transparent spray adhesive, such as Scotch® 77. By printing in reverse, the toner is protected from exposure to your hand while tuning. The result is a very professional-looking calibrated dial.

It's important to lay out the filter to minimize stray coupling. **Photo F** shows that each coil has its axis at right angles to the other coils. This minimizes unwanted inductive coupling. It's also a good idea to allow as much space as possible between the coils. I experimented with shielding between the coils but found it unnecessary.

I wired the filter with no. 16 AWG magnet wire and tried to keep each wire at least a half-inch from neighboring wires and from the chassis and

other structural elements. It's important to keep stray capacitance to a minimum. Wherever possible, don't run wires parallel to each other.

The input and output connections are made through BNC connectors and short internal runs of RG-174 coaxial cable.

Section 3 — Adjustments and measured performance

When first assembled, I found poor performance above 1000 kHz. Between 1000 and 1700 kHz, the pass-band had multiple peaks and poor roll-off, both evidence of over-coupling. While I expected problems with overcoupling arising from the tracking error, the result was far worse than envisioned.

Resonance at 1700 kHz corresponds to a node tuning capacitance of 35.6 pF that is achieved, allowing for strays and distributed capacitance, with around 27 pF or so of main tuning capacitance. Fully unmeshed — 180 degrees of shaft rotation — my main tuning variable only had 14 pF, corresponding to a center frequency near 2200 kHz. 1700 kHz occurred at 150 degrees of main tuning capacitor shaft rotation.

Our design assumed that the coupling variable would be at its minimum capacitance — 180 degrees of shaft rotation — at 1700 kHz. Since I had synchronized the coupling variables to achieve minimum capacitance at the same shaft rotation angle as the main tuning capacitor's minimum capacitance, I clearly had too much coupling capacitance at 150 degrees rotation. To reduce the coupling at 1700 kHz, I set the coupling variables to be fully open when the main tuning variable was peaked at 1700 kHz. Thus, the main tuning variable and the two coupling variables are out-of-synchronization by 30 degrees.

This significantly, but not completely, improved the response above 1000 kHz. The downside is that at lower frequencies, the resonators will be undercoupled, as when the main tuning capacitor is fully meshed, the coupling capacitors are short of full mesh.

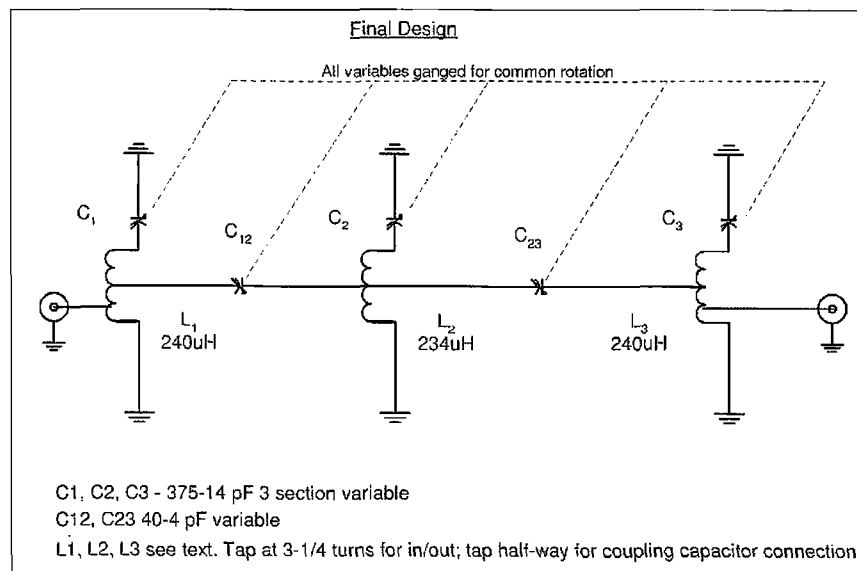


Fig. 6. Final design.

Although much improved, the frequency response at 1700 kHz still showed signs of multiple peaks. Driving the filter with a signal generator at 1700 kHz, I measured the voltage across each resonator with an oscilloscope and an X10 probe. All oscilloscope probes introduce some shunt capacitance that detunes the resonator being measured. Hence, we have to look for relative shifts between the resonators.

As I slightly moved the tuning control, I saw that one resonator peaked at a higher dial frequency than the other two. Upon reflection, the problem was obvious; the out-of-resonance circuit involved L_1 , which was wound with no. 24 AWG, resulting in about 3 pF less distributed capacitance than its counterpart L_3 wound with no. 22 AWG wire. This small difference in total capacitance shifted the resonant point enough to disturb the passband response. A 3 pF silver mica added across L_1 brought all three inductors into synchronization and removed the separate passband peak. (At lower frequencies, a difference of 3 pF becomes negligible; at 1700 kHz, 3 pF is 8% of the total resonating capacitance!)

Fig. 7 shows the passband response of the completed filter, after making these two alterations. In general, it conforms to our design, except for narrower-than-predicted bandpass at 550 kHz and a wider-than-expected bandpass at both 970 kHz and 1700 kHz. In addition, the passband isn't as flat as might be desired. One predicted result of finite-Q inductors is passband tilt.

As with any filter, far-out-of-band rejection may be of concern due to self-resonance of inductors and stray coupling. To examine this, I looked at the response from 3 MHz to 50 MHz with an HP 8754A network analyzer. **Photo E** shows the response 4–50 MHz, at 10 dB/division. (The filter was tuned to 600 kHz, but its passband is below the 4 MHz minimum frequency of the network analyzer.) Spurious responses around 6 and 11 MHz appear to be associated with the self-resonant frequencies of the resonator inductors, whilst the higher frequency responses

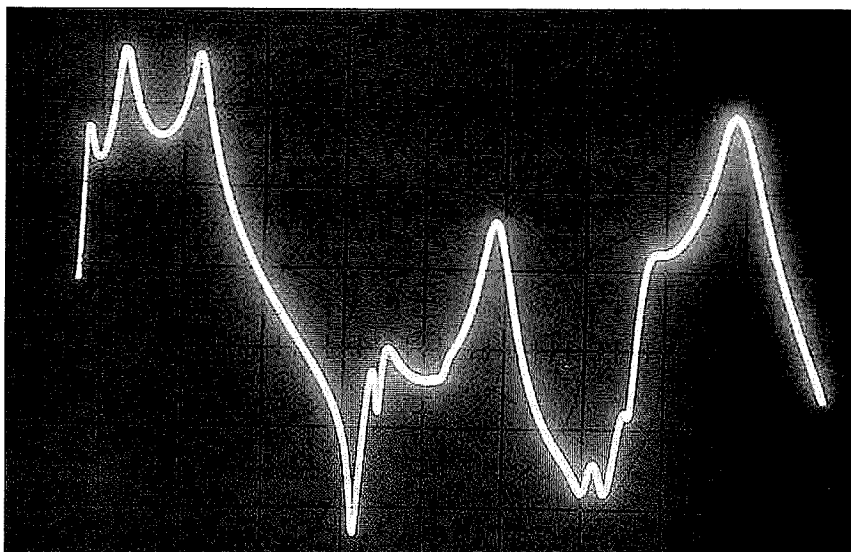


Photo E. The filter has high frequency spurious responses (5 MHz/div. & 10 dB/div.).

likely result from stray inductance and capacitance in the connecting wiring. If far-out-of-band attenuation is a concern, a simple low pass filter with a cut-off of, say, 2.5 MHz could be added.

References

A.I. Zverev, *Handbook of Filter Synthesis* (Wiley, 1967). Zverev's book is still in print 35 years after initial publication and should be in the library of anyone seriously interested in filter design. If the breathtaking price of a

new copy is difficult to justify, ask your local public library for a copy via interlibrary loan.

A.B. Williams and F.J. Taylor, eds. *Electronic Filter Design Handbook, Third Edition* (McGraw Hill, 1995). Out of print, but available from used bookstores and via interlibrary loan. Includes good active filter section and reproduces some of Zverev's most important tables and graphs.

W.E. Sabin and E. O. Schoenike, eds. *Single-Sideband Systems & Circuits*, (McGraw Hill, 1987), or the revised edition, originally published as

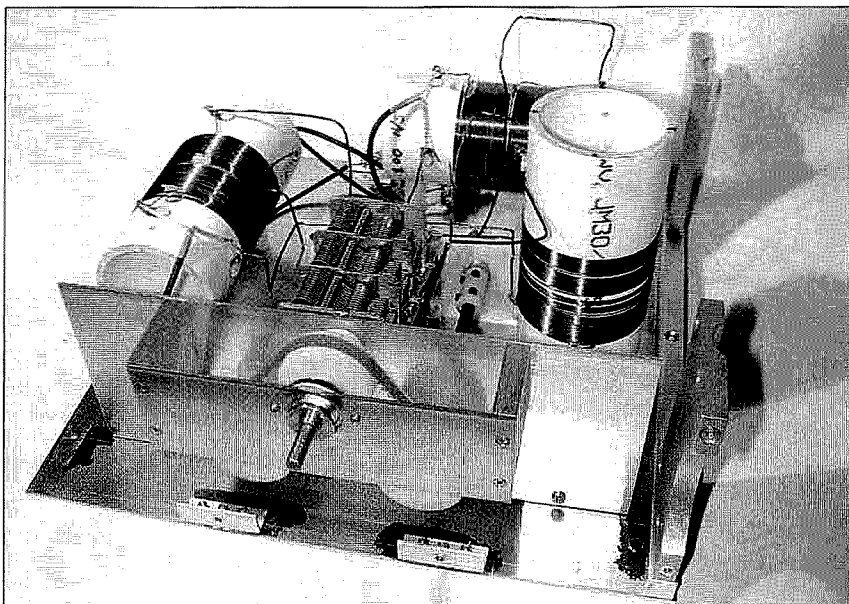


Photo F. Mount the coils so that each is at right angles to the others.

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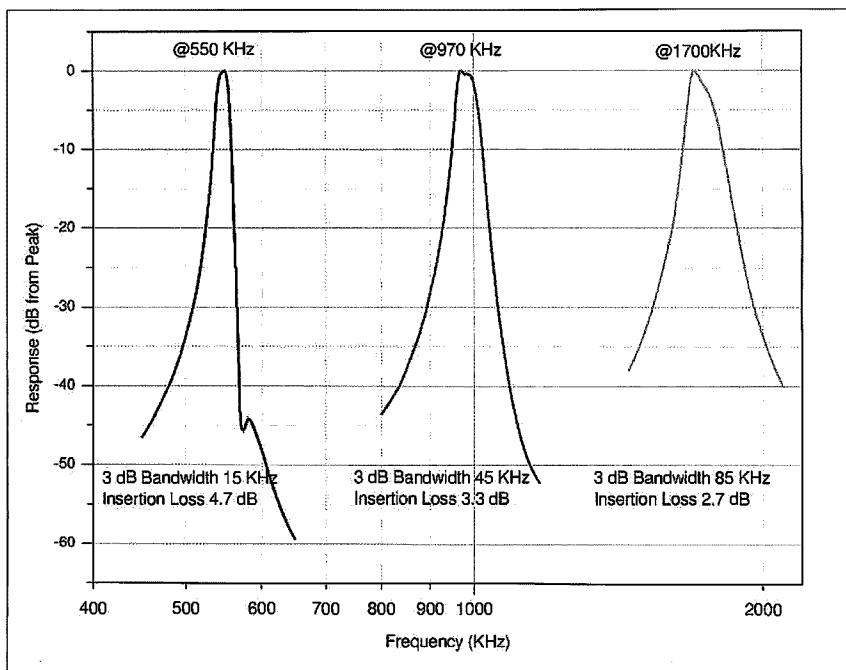


Fig. 7. Passband plot.

Single-Sideband Systems & Circuits, 2nd Ed. (McGraw Hill, 1995), reprinted as *HF Radio Systems & Circuits* (Noble Publishing Corp., 1998). Both the first and second editions devote a complete chapter to preselector design, and offer many theoretical and practical suggestions.

F.E. Terman, *Electronic and Radio Engineering, 4th ed.* (McGraw Hill, New York, 1955). The classic radio engineering textbook, readily available from used bookstores and should be in the library of every technically inclined ham.

Parts sources

One source of vernier reduction drives and variable capacitors, including three-section broadcast variables, is Ocean State Electronics, 6 Industrial Drive, P.O. Box 1458, Westerly, RI 02891: phone: 401-596-3080; (fax) 401-596-3590. Web site: [http://www.oselectronics.com].

Mechanical parts, including miniature drive belts and pulleys, can be found at Small Parts, Inc., 13980 N.W. 58th Court P.O. Box 4650 Miami Lakes, FL 33014-0650, Phone orders:

1-800-220-4242. Web site: [http://www.smallparts.com]. Another possible source of similar products is SDP/SI, 2101 Jericho Turnpike Box 5416, New Hyde Park, NY 11042-5416. Web site: [http://www.sdp-si.com/index.asp].

I bought many of the mechanical parts and material stock from MSC Industrial Supply Co., via their Internet ordering site: [http://www.mscdirect.com].

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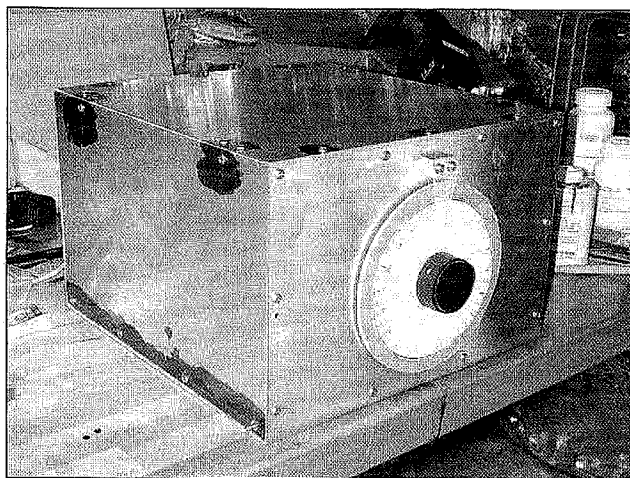


Photo G. Test assembly of the cabinet and dial, before painting.

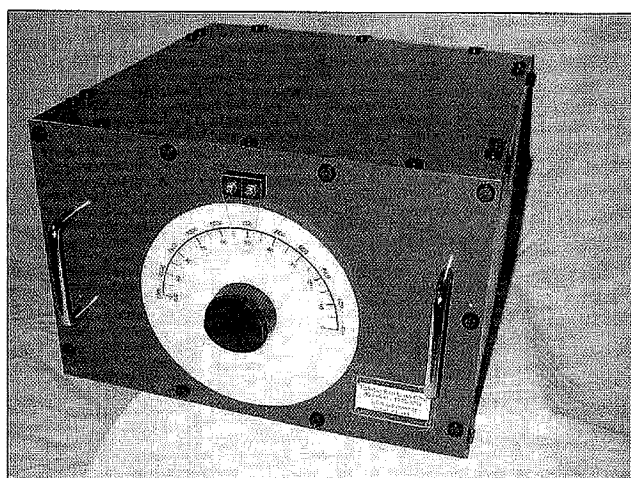


Photo H. Completed filter.

How to Make a Butterworth Low Pass and Bandpass Table

Low Pass Prototype

The Butterworth prototype low pass g-values for infinite Q can be calculated very easily with a spreadsheet program, such as Excel®, or a scientific calculator. The key equations are:

$$g(n) = 2\sin[\pi(2n - 1)/2N]n = 1, 2, \dots, N$$

$$g(N + 1) = 1$$

N is the order of the filter. One point to remember is that the argument for the sine function is expected to be in radians. So, if your calculator is set for degrees, a conversion is necessary. Excel assumes radians, so no conversion is necessary if you set up a spreadsheet.

Let's go through a couple of examples. **Table S1**, for Butterworth low pass prototypes, can be found in many references, including recent ARRL handbooks.

For a 4th-order filter (N = 4), we will calculate g(0) through g(5). We'll use $\pi = 3.14159$ as accurate enough for our calculations.

g(0) — We can either calculate it, or note that g(0) always is 1.000.

g(1) — Plug in N = 4 and n = 1 into the g(n) formula.

$$g(1) = 2\sin[3.14159 \times (2 \times 1 - 1)/2 \times 4] = 2\sin(3.14159 \times 1/8) = 2\sin(.3927) = 2 \times 0.3827 = 0.7654$$

If your calculator expects the argument for sin(x) to be in degrees, multiply 0.3927 radians by 57.30 degrees/radians. $0.3927 \times 57.30 = 22.50$ degrees. $\sin(22.50 \text{ degrees}) = 0.3827$.

g(2) — Plug in N = 4, n = 2 into the g(n) formula.

$$g(2) = 2\sin[3.14159 \times (2 \times 2 - 1)/2 \times 4] = 2\sin(3.14159 \times 3/8) = 2\sin(1.1781) = 2 \times 0.9239 = 1.8478$$

g(3) — We can either calculate g(3), or note that the Butterworth coefficients exhibit symmetry about the midpoint, such that $g(n) = g(N - n + 1)$. In this case, n = 3, N = 4 so $g(3) = g(4 - 3 + 1) = g(2)$. We know $g(2) = 1.8478$, so $g(3) = 1.8478$ as well.

g(4) — Likewise, we can use the symmetry relationship and simplify the calculation. $g(4) = g(4 - 4 + 1) = g(1)$. We know $g(1) = 0.7654$, so $g(4) = 0.7654$ as well.

g(5) — Now, n = N + 1, so we have to use the special formula, $g(N + 1) = 1.000$. Hence, $g(5) = 1.0000$.

By repeating these calculations, we can complete the Butterworth low pass filter table for any order that we wish.

Convert to bandpass table

Our converted bandpass table will contain two data elements; normalized Q values and normalized coupling coefficients.

Normalized Q values are q_1 and q_n , where q_1 is with respect to the first resonator and q_n is with respect to the last (nth) element. For a particular filter of order N, the q values are very simply related to the g parameters of the low pass filter prototype of order N:

$$q_1 = g(1)$$

And, since Butterworth filters are symmetrical, $q_n = q_1$.

The normalized coupling coefficients are expressed as k_{12} , k_{23} , etc., where k_{12} is the coupling coefficient between resonators 1 and 2, k_{23} is the coupling coefficient between resonators 2 and 3. k_{ij} is the coupling coefficient between nodes i and j. The relationship between the coupling coefficients and g values is given by:

$$k_{ij} = 1/\sqrt{g(i)g(j)}$$

Table S2 is a bandpass table corresponding to the low pass table in **Table S1**.

Now, let's see how these values were calculated. We'll again look at the N = 4 values.

q_1 — Determining q_1 is easy. $q_1 = g(1)$, or 0.7654.

q_n — Since $q_n = q_1$, $q_n = 0.7654$.

k_{12} — We previously found that $g(1) = 0.7654$ and $g(2) = 1.8478$. We now use these values to calculate k_{12} :

$$k_{12} = 1/\sqrt{g(1)g(2)} = 1/\sqrt{0.7654 \times 1.8478} = 1/\sqrt{1.414} = 1/1.1892 = 0.8409$$

k_{23} — We calculate k_{23} the same way, noting that $g(2) = 1.8478$ and $g(3) = 1.8478$:

$$k_{23} = 1/\sqrt{g(2)g(3)} = 1/\sqrt{1.8478 \times 1.8478} = 1/\sqrt{3.414} = 1/1.8478 = 0.5412$$

k_{34} — Again, we can calculate k_{34} using the approach shown for k_{12} and k_{23} , or we can again take advantage of symmetry and save a calculation. Symmetry requires $k_{ij} = k_{(N-i)(N-j+2)}$. Since for our sample N = 4, $k_{34} = k_{(4-3)(4-4+2)} = k_{12}$ or k_{12} . Accordingly, $k_{34} = 0.8409$. 73

	n					
	0	1	2	3	4	5
N	g(0)	g(1)	g(2)	g(3)	g(4)	g(5)
2	1.0000	1.4142	1.4142	1.0000	—	—
3	1.0000	1.0000	2.0000	1.0000	1.0000	—
4	1.0000	0.7654	1.8478	1.8478	0.7654	1.0000

Table S1.

N	q1	qn	k12	k23	k34
2	1.4142	1.4142	0.7071	—	—
3	1.0000	1.0000	0.7071	0.7071	—
4	0.7654	0.7654	0.8409	0.5412	0.8409

Table S2.

How to Avoid a Disaster Disaster

And how about putting the field back in Field Day?

What do Field Day and disaster communications have in common? Before Field Day turned into a beer-guzzling barbecue party, it was intended to test our preparedness for communicating in disasters, and other emergencies. While some clubs still actually bring radios and antennas out to their Field Day parties, I've found it unfortunate that the primary concern discussed on local repeaters is, "Who's bringing the potato chips?", instead of, "Who's got the emergency generator?"

Returning to the original intent of Field Day, it should be identical to disaster and emergency communications, minus the body bags. A good way to tell if you, or your club is ready for either is to imagine the following scenario: Your club president (or other ham official) calls you at three o'clock in the morning to chase you out of bed. You have to grab your emergency radio kit and get to point "X," ready to jump in with ham communications.

Are you ready? The most common mistake I've seen made is that people bite off more than they can chew: They think that they have to bring their entire ham shack, and set it up. In reality, though, face it: You don't operate everything at once while you're at home, even under the best of conditions.

No one expects you to do that under the extremes of disaster communications, either. Focus on what you're good at. For example, if you're an avid off-road enthusiast complete with an appropriate vehicle, consider a mobile "command vehicle" that you can take right up to the site (or as far as the police or fire officials will allow — be prepared to show identification if asked).

You can then help coordinate communications in and out of the site. Are you an avid hiker? Then you might be the perfect candidate to tag along with the command vehicle, and be prepared to hike the last stretch to the emergency site. Emergencies do not always take place in areas that are accessible by vehicle, and the last stretch may have to be taken on foot. Duffel bags are built a bit more ruggedly than backpacks, and come equipped with backpack-like straps to allow hands-free carrying. You might want to consider one of those to carry your equipment the last stretch. Emergency supplies like blankets can serve as protection from radio equipment getting banged up along the way. You won't need high-power equipment, either: all you'll need is a minimum of equipment, since all you need to reach is the command vehicle. That vehicle, with its engine-driven power supply, makes for an ideal relay station to the outside world.

The most neglected aspect I've noticed in emergency communications is the repeater. Very few have backup power supplies that can sustain emergency communications, even in low power. If you or your club can't afford

a large back-up power source, consider extending the life of a smaller source and toggle off the amplifier. Even low-power repeaters, through their exceptionally good antenna height, have better coverage than mobiles and portables. Remember: You're not out to work repeater DX — just get a message out of the emergency site. Police departments have been using repeaters, called mobile extenders, in their squad cars for years, and they work well even with the low antennas. Again, they're not out to work DX — just to get their hand-helds' signal from where they are back to a central dispatch center.

For these applications, it's a good idea to have a second repeater that can be used for a backup in case the first one goes down. Not everyone has the technical ability to fix their own repeaters (unfortunate but true), and in the middle of an emergency you can't put things on hold for two months while you send the repeater back to the manufacturer for repair. The only other option is to have enough spares for your repeater lying around to get things back on the air with a parts

Continued on page 58

Ready, Set ... Don't Go?

The time for preparation to be a meaningful participant in the next emergency situation is before the event occurs.

Not that we're looking forward to catastrophes, but to be prepared to operate effectively and efficiently in such times makes planning and training essential ingredients for success.

When the catastrophe of September 11th struck New York City, the call went out for volunteers to provide a multitude of needed services. Amateur radio operators and their portable equipment were but one of the services desperately needed in the city during the initial days following the disaster.

One of my fellow radio amateurs and a few of his friends rallied round the kitchen table that evening and decided that they were able to "get away" for a few days. Filled with good thoughts and ambition, they answered the "call."

But guess what?!!

They were politely denied the opportunity to serve, because "they" didn't know who my friends were!

They hadn't taken the preparedness course! Therefore, they weren't registered volunteers in the Red Cross databank!

Identification

"They" would have been glad to have had my friends' services had they only attended the required orientation course necessary of all volunteers, and possessed the Red Cross identification

badge. Other amateur operators who had attended the orientation course were promptly assigned duty positions and put to work.

"They" weren't able to let my friends provide a service as amateur radio operators at a time when communications were desperately needed, because they hadn't made the necessary preparatory steps to be qualified volunteers when the need arose! Without the prior training and identification, they could have become a liability to the effort!

You've got to understand the atmosphere of the moment. When the need for volunteers went out to the amateur radio community, hams from a number of places responded to the need. To coordinate the use and positioning of these people and their equipment, other volunteers manned posts designed to track people and know where they are. The effectiveness of the relief effort is vastly improved when the volunteers being managed are all familiar with the organization providing the overall relief effort.

Well, my friends weren't some of those "qualified individuals," and the disaster has long since become history.

Hopefully, there won't be another event like that one, but I wonder: What does "being qualified" really mean?

You've already become licensed as an amateur radio operator and you've equipped yourself with some really nice radios. But what possibly could be the reasons for not using your talents?

Volunteer orientation course

Organizations like the American Red Cross rely on volunteers to provide wide-scale activities at major disaster locations. These workers have access to data files that provide them with information needed to perform their function. One of these files is an "Identification File." In it are contained the names, addresses, telephone numbers, etc., and what the volunteer's particular specialty is, if any. The information for the "identification file" was gathered from documents completed at a "volunteer orientation course."

Mother Nature seems to take particular delight in testing our resolve. So, because my "crystal ball" for the perfect world is often cloudy and I haven't any idea of when the next disaster will

Continued on page 58

'Quaker Oaths

In 1989, the ARS came through ... is it still ready?

Within minutes of the October 17, 1989, San Francisco earthquake, hundreds, maybe thousands, of amateur radio operators responded statewide and nationwide. While Pacific Bell Telephone suffered little damage, the lines into and out of San Francisco were jammed. According to a telephone company spokesman on the ABC news, some 25,000,000 callers attempted to reach San Francisco almost instantly.

The number of callers continued unabated for three days. For the average citizen trying to find out about his loved ones or friends, there was only amateur radio to turn to.

Thousands of "health and welfare" messages flowed into and out of San Francisco and areas to the south. The hours of preparedness drills paid off for those who devote themselves to emergency communications. Statewide nets responded almost instantly, with long-haul nets close behind.

Digipeating packeteers

According to Lew Jenkins N6VV, president of the Northern California Packet Radio Association, digital, rather than analog, communications prevailed. "We had it coming in on AMTOR; on packet via HF nets; and it could be easily warehoused in the devastated area, then worked [delivered] at the convenience of the folks there."

Jenkins added that the ability to "digipeat" by every ham running

packet offered many advantages over conventional voice repeaters with traffic on VHF and UHF: "No other mode gave that form of audit trail and trackability. And the adaptive nature of the networks — not having to rely on one repeater — let us switch [work around it] when we lost one of our major nodes down at Crystal Peak; we just brought up additional nodes. We were able to create a new path into areas where we needed to get traffic ..."

Digital-analog cooperation

One of the long-running bones of contention between digital and analog amateur communications has been the self-imposed isolation between the two. The ARRL has tried to remedy this by asking voice repeater coordinators to take on packet and digipeater coordination, but virtually all have declined. This has led to even further isolation. But in California, this isolation ended when the quake began to rumble.

N6VV seems to feel things have changed: "The combination of the automatic routing capability of packet and the appropriate use of the FM

networks ... made it work. When we got word [via packet] of emergency relief supplies from Los Angeles, the first thing we did was to get on 2 meters [FM voice] and contact the E.O.C. in Santa Cruz, which passed that traffic on the Loma Prieta machine ... Meanwhile, 'health and welfare' traffic was flowing [on packet] all of the time that the [voice] conversation was going on."

But there were some reports of packet-oriented hams being a bit too zealous about proving the importance of their favorite mode at a time when they should only have been worrying about getting messages through. Several apparently showed up at disaster coordination sites armed with radios and TNCs, but no microphones. They insisted that packet was better than voice for "tactical" amateur radio communications from the streets.

Jenkins thinks this was a pretty bad idea: "... The general reaction up here was that talking keyboard-to-keyboard in an emergency situation was not that effective. There may be some isolated cases where we will see that it worked. But what we did was to try to get some people with portable packet gear into

the affected areas to take 'health and welfare' outbound traffic ..."

The lifeline for the city

The quake's epicenter was near the once-picturesque town of Santa Cruz some 50 miles away. Santa Cruz was devastated and cut off. Also hard hit was the city of Hollister. A day after the quake, NBC Network News producer Alan Kaul W6RCL visited the Red Cross Evacuation Center in Hollister with a camera crew for Nightly News. Alan and crew came across an amateur radio station that was literally the lifeline for the city. Al was very moved by what he saw, and called Amateur Radio Newslines with the following story:

"One of the Red Cross Centers was at the San Andreas High School in Hollister, California, about 30 miles east of the earthquake epicenter. Hollister is the so-called 'earthquake capital of the world' because it is at the junction of three of California's most active faults — the Calaveras, the Hayward, and the San Andreas. Officials here were ready for a quake. They had rehearsed just three months before.

"RACES member Al Romeo N6OJO of San Jose was one of the volunteers who ran the amateur station at the San Andreas school. Forty families whose homes were now unsafe had moved into the shelter. N6OJO, N6RCO, N6DDM and WA6BWT took turns providing coordination. Much of the effort involved keeping the shelter in contact with Red Cross headquarters about fifty miles away near San Jose. They had a packet radio system and were prepared to handle health and welfare messages on HF and VHF radio.

"The amateur radio operation was manned around the clock for about forty hours until power and telephone links were restored. And what type of messages do radio amateurs handle during an emergency like the quake? One order via 2-meter radio in San Francisco was to a drugstore for the purchase of three hundred desperately needed baby bottles."

Alkaline batteries last longer

What did N6OJO learn from his

experiences in the quake? Not to rely on NiCd batteries. There was no good way to charge them when the power was off for so many hours. He said that dry-cell, alkaline batteries last much longer, and he suggests that anyone preparing for an emergency stock up on them.

The Condor Connection

Given the 220 MHz controversy, it's ironic that the statewide backbone of amateur radio emergency communication was not HF, but rather the 220 MHz statewide open interlink called the Condor Connection. Designed and built by Mark Gilmore WB6RHQ and the late W6TLG, the Condor Connection covers the state from San Francisco/Sacramento to the US-Mexican border, and east to Arizona and Nevada. This open system functions as a three-state super-repeater with the ability to handle massive amounts of voice traffic free of the kinds of natural and manmade interference often hampering HF links. WB6RHQ had engineered Condor to withstand a quake of this magnitude or greater, and on October 17 this attention to detail paid off. Condor withstood the test and went on to handle a traffic load that would boggle the mind of anyone listening in.

There is no way to establish the message count handled by those using Condor, but it has to be in the thousands. Unfortunately, the Condor Connection is slated for oblivion. The FCC recently reallocated the spectrum between 220–222 MHz to Land Mobile Services.

What about the next time?

In the crowded amateur bands of California, there is no place left to relocate the Condor Connection. As vital as it is, there appears to be no way to convince repeater owners of 2 meters, 220 MHz and 450 MHz to vacate channels for Condor.

As I am writing this only hours since the emergency began, information pertaining to amateur radio involvement is still scarce. Some of it, regarding organized malicious interference, is

dismaying. I enjoy writing about the triumphs of those in our hobby/service who, like Al Romeo N6OJO, Frank Collins N6TAF, Lew Jenkins N6VV, Mark Gilmore WB6RHQ, and countless others whose names we may never know, are providing the kind of community support indicative of what we hams are supposed to be.

The San Francisco quake brought many hams closer than ever before. It proved the importance of the new digital modes and their ability to handle volumes of traffic quickly and effectively. It has also opened up a new dialogue between the analog and digital worlds that will definitely lead to more interaction and cooperation between the two.

CBers not to blame

But the quake also pointed out that we have among our ranks psychotics holding amateur radio operator licenses. We cannot excuse the organized jamming of the emergency communications. We can't blame it on "CBers with stolen rigs." Hams did it. People who studied for their licenses. Who took a test of Morse Code and amateur radio theory. Human beings who probably shelled out several thousand dollars to set up a ham station, and what for? To destroy!

In the late 1970s and early 1980s, California had a master legal tactician who devoted himself to putting the sickies off the air. He was able to reduce the amount of malicious interference to almost zero. The Dayton Amateur Radio Association recognized his work and awarded him its Specific Achievement Award. His solving the jamming problem also almost cost him his life when he suffered a massive heart attack as a result. Joe Merdler N6AHU, where are you when we need you! 73

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Ham vs. Power Outage

Here's a solution that will warm your heart — as well as your wife's toes.

Have you ever experienced a long power outage? I don't mean a few hours. I mean days on end! Here in South Bend, Indiana, we had a severe ice storm that, according to our newspaper, knocked out the power to 100,500 customers.

It all began Wednesday night, January 30, 2002. I was watching The Weather Channel late in the evening, and I saw the warning roll across the bottom of the screen: "Sleet and freezing rain." The temperature was going to hover around freezing through the night, accompanied by precipitation. I put my HT on charge, and checked all the flashlights in the house (just in case). Then I went to bed.

I got up the next morning as usual at 5:30 and looked out the windows.

Everything was coated with at least 1/4 inch of ice! I noticed that the trees were moving — uh-oh! Wind! I noticed that there were flashes of light coming from all directions. The flashes looked like lightning, but there was no thunder.

At 5:45 the power went out in our neighborhood. With the street lights and yard lights out now, I could see the flashes more clearly. The flashes were different colors: red, yellow, green, blue. What the heck is going on? Then I figured it out. The flashes were the

sparks from the power lines arcing. The flashes continued.

I muttered to myself: "This is gonna be bad ... really bad ..."

I fixed a quick breakfast and listened to a few local radio stations on my battery-powered radio. Power was out in many areas of town.

Luckily, I had prepared for this exact situation. We have hot water heat in most areas of our house and a forced air system in the back of the house. The hot water heat lines run around the perimeter of the inside of the house. I

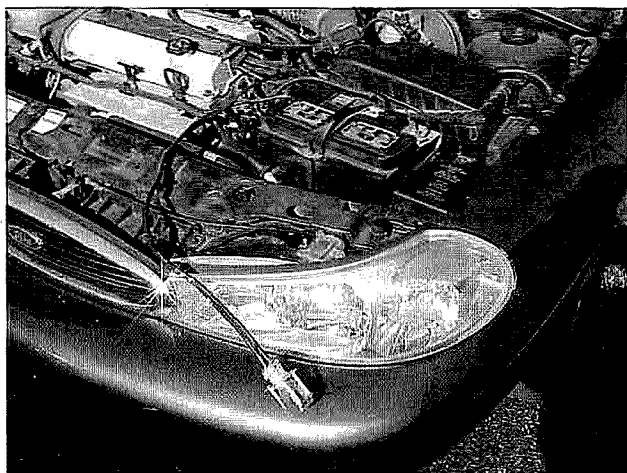


Photo A. Female connector and #6 cables connected to car battery.

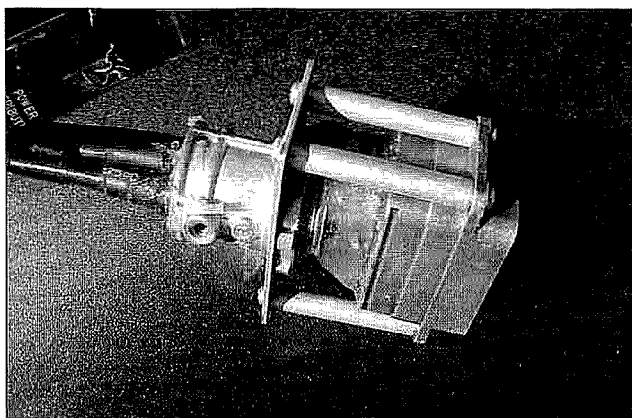


Photo B. Close-up of connector on battery cable. Note homemade backshell consisting of metal stand off's conduit fitting and bathtub sealer.

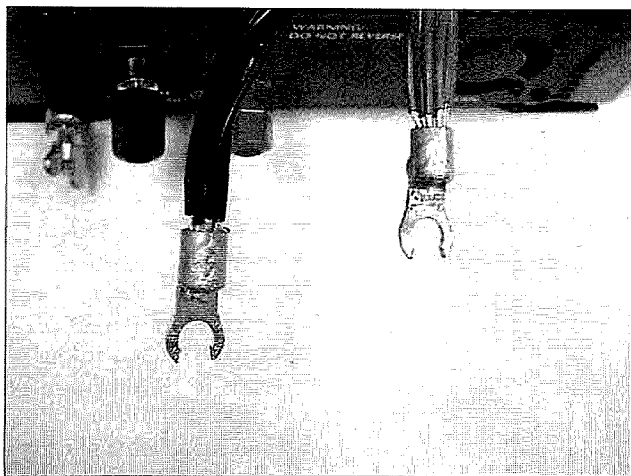


Photo C. This shows the connectors that fit the inverter input terminals. Part of the ring must be removed to allow it to attach to the 5-way binding posts.

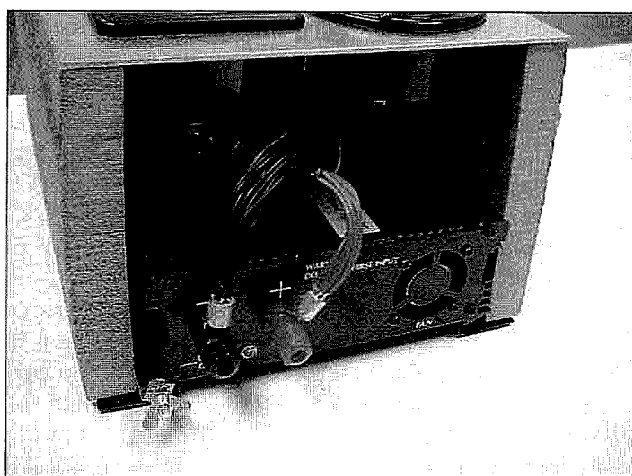


Photo D. The flexible leads are shown attached to the inverter input terminals. I used black and red wires for the negative and positive leads (respectively).

knew that if the power went out for a long time in winter, the house could get so cold that the water lines would be the first to freeze and then burst. This would be followed by the rest of the water lines in the house. If the lines burst we would have a royal mess on our hands.

To heat our house, a minimal backup power system needs to run only the blower on a small furnace in part of our house and a small water pump to circulate the hot water in the rest of the house. Both furnaces use natural gas as a source of heat.

Back when Y2K was a big deal, I thought about what we would need to get by at our house if the power went out. That's when I decided against

buying a generator and instead bought an inverter — a device that converts the 12 VDC from your car battery to 120 VAC. Of course Y2K was a big fizzle, and I never heard of any power failures. The heck with Y2K, Mother Nature was going to see to it that we would be put in the dark!

In the remainder of this article, I'll tell you what I do to keep our house warm in the winter when there is a power failure, and how to do the same for yours! I know you're wondering: How much time did I spend and how much did it cost? Well, I spent about 10 hours making wiring changes, fabricating some cables, and doing a small amount of metalwork. The inverter I bought cost \$130, the optional meters

cost \$10 at a hamfest, and the electrical boxes cost a few dollars. 10 hours and \$147 — not bad for keeping our house warm in the middle of winter.

Overview

To use the inverter, you will need to change the furnace's power wiring, add two large cables and a connector to your car's battery, and make up a cable with connectors to attach to the inverter.

Wiring changes to your car

I obtained two 3-foot lengths of #6 stranded insulated wire from an electrical supply store. It is labeled "oil and gasoline resistant" on the insulation.

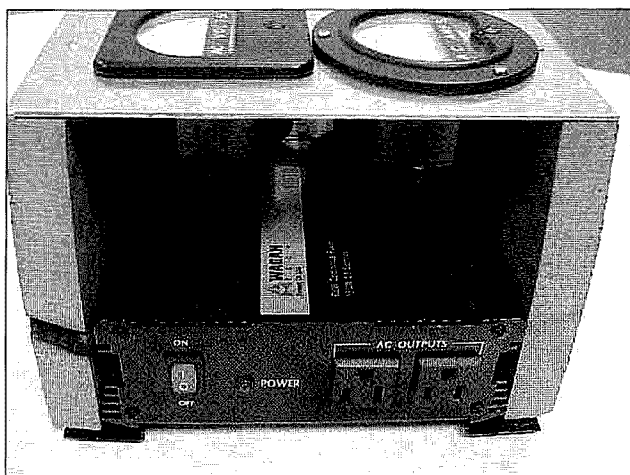


Photo E. This shows the front end of the inverter assembly. Wood screws attach the inverter mounting brackets to the wood sides.

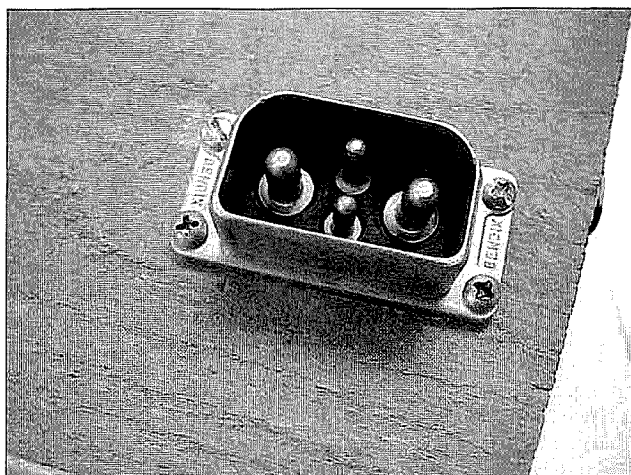


Photo F. The male connector mounted on the side of the inverter assembly.

On one end of each wire I soldered a lug with a hole to match the size of the bolt on each terminal of my car battery. The other end of both cables is soldered to a female connector. I found this connector in my junk box. It must have large contacts to carry high current — more on this later. You will, of course, need the mate to it. Be sure to put the female connector on the battery leads. If it flops around and gets near the car body or frame, there won't be any pins sticking out that can short to ground. See **Photo A**.

My connectors didn't have backshells when I found them at the hamfest. (You can't have everything!) I made my own from four standoffs, an aluminum plate, and a conduit fitting. The conduit fitting holds the cables securely to the connector so that the soldered connection isn't strained. After soldering and securing the cables with the conduit fittings, I put some bathtub sealer all around where the wires are soldered to the connector. This keeps water out and prevents a short to ground in the engine compartment when the connector is not in use. See **Photo B**. When it's not in use, I wrap the car connector in two ziplock bags to keep out water and dirt.

I knew that the current drawn from the battery would be 40 to 50 amps, since the inverter must pull 600 watts from the battery if it supplies 600 watts to the motor. (According to Ohm's Law, $P = EI$, so $12 \text{ VDC} \times 50 \text{ amps} = 600 \text{ watts}$.) Any resistance between the inverter and the battery terminals will drop the voltage available to the inverter. As an example, with 50 amps current draw, a $1/4 \text{ ohm}$ resistance can drop the voltage available to the inverter by 1.25 volts. (Again, according to Ohm's Law, $E = IR$, so $50 \text{ amps} \times 0.25 \text{ ohm} = 1.25 \text{ volts}$.)

Why worry about a voltage drop? It turns out that the inverter will shut itself off if the input voltage drops below 10.5 VDC. I assume it was designed that way to avoid damaging a battery if the voltage drops too low. If there is a 1.25 volt drop across a connection and the battery voltage goes below 11.75 volts the inverter shuts itself off and your furnace won't start.

I measured the resistance of the connector contacts in my unit with a milliohmmeter and found it to be 0.001 ohm. That works out to about a 0.05 volt drop at 50 amps current draw — very nice!

Power inverter and mating connector

Next, you will need to fabricate a cable that connects the inverter 12 VDC input terminals to a male connector that is the mate to the connector from your car battery. See **Photo C**. The 5-way binding post connectors on the inverter are a bit flimsy — I wanted a strain relief to prevent damaging them. I did this by making a cable that consists of 12 conductors of #16 Teflon wire.

A minimal system consists of cables and connectors only. I chose to add metering to monitor the battery voltage and the battery current drawn by the inverter. To do this, I mounted my inverter on two pieces of wood and placed an aluminum plate atop the wood pieces to hold the meters. See **Photos D and E**. (As you can see, there are actually four meters in my setup. Two of the meters monitor the incoming 12 VDC current and voltage. The other two were intended to monitor the output 120 VAC voltage and current. I mounted all four meters but then couldn't figure out a way to get the AC lines to the meters and then back inside the inverter. This will be a project for the summer — not winter,

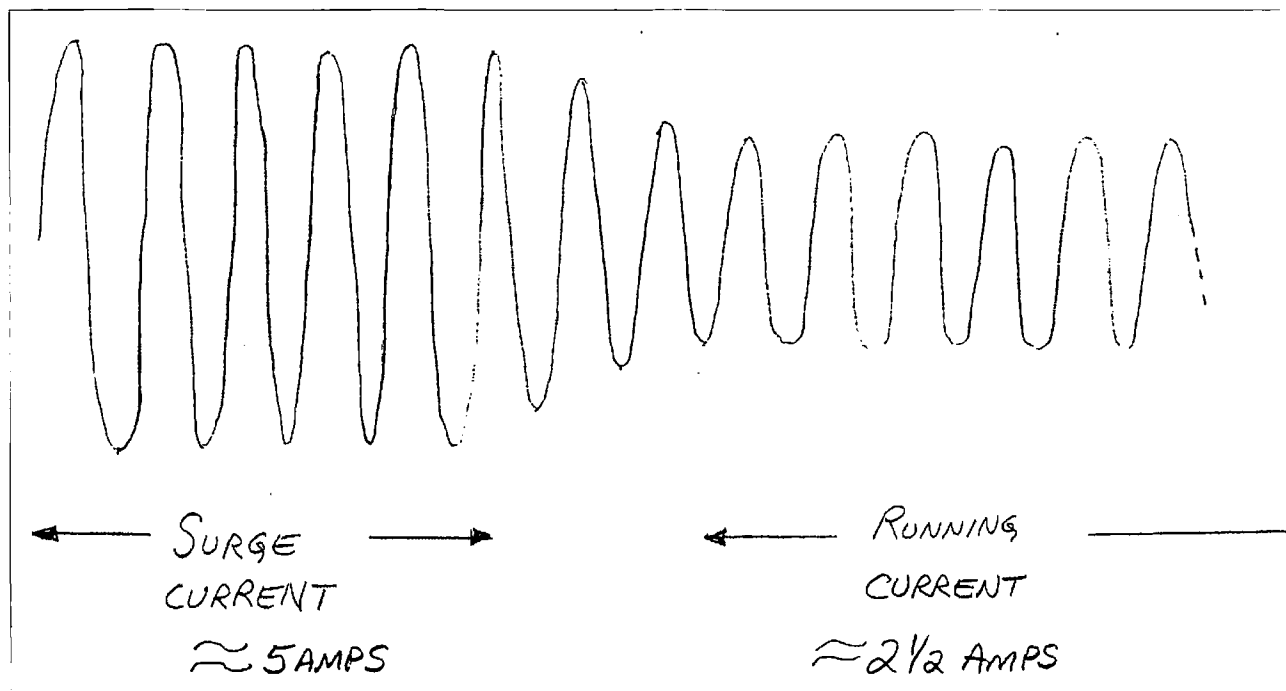


Fig. 1. Current display on a storage oscilloscope.

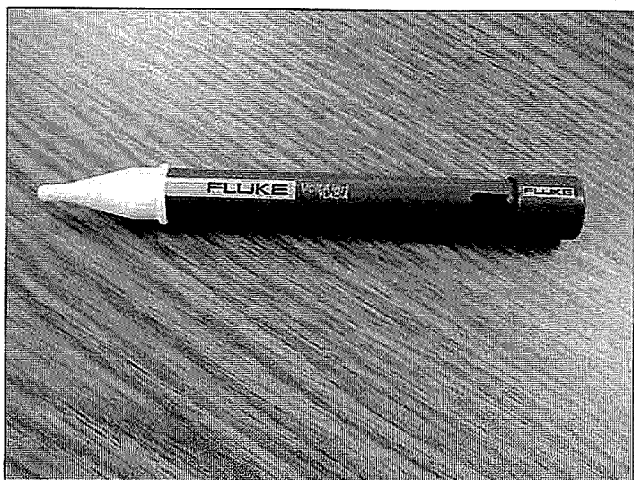


Photo G. The Fluke "VoltAlert" voltage sensor I used to make sure the power is turned off.

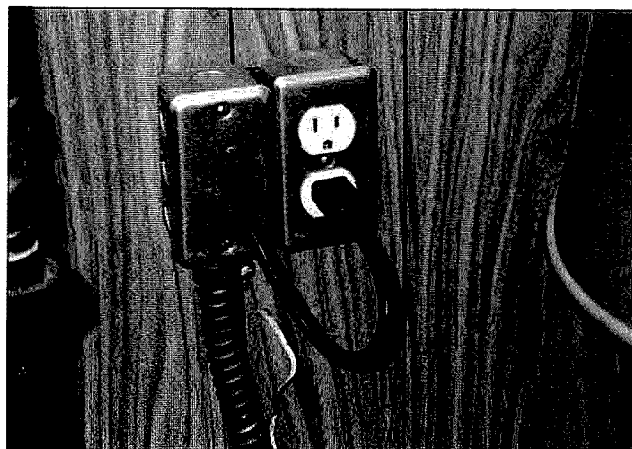


Photo H. The new furnace wiring. The box and duplex outlet on the right is wired to house power. The box on the left contains the wiring that connects the furnace to the 3-prong plug.

when I might need the inverter at any moment!) The short, very flexible cables serve as a strain relief for the meter terminals. The wire runs were quite short between the meter and terminals so that routing and bending of the rigid #6 wire was difficult. I mounted the mating male connector on the side of the wood panel. See **Photo F**.

Determining the inverter size for your application

If the motor in the furnace has a nameplate, look for the current rating in amps. To determine power simply multiply this amp rating by 120 volts to get running watts. This is the power the motor consumes when it is running. The starting current is higher but lasts only a very short time. My motors pulled the surge current for approximately 100 milliseconds. The motor in my hot water heat system pulls 1.7 amps (200 watts) surge and 0.8 amps (96 watts) running. The motor in my forced air heat system pulls 5.4 amps (648 watts) surge and 3.8 amps (456 watts) running. I used a clamp-on ammeter to make the readings.

The surge is of such short duration that you may not be able to obtain a meaningful reading by just looking at the display. You'll need a faster-responding display such as a clamp-on ammeter that has connections for coupling the sensed current to an external device such as a storage oscilloscope. A storage oscilloscope will allow you

to view the instantaneous sensed current if you set it to trigger on an incoming signal. If you don't have access to a clamp-on ammeter with terminals and storage oscilloscope you can estimate the surge current by simply multiplying the nameplate current by 120 VAC then multiplying it by 2. (This method assumes that the surge current is at most double the running current.) If you are fortunate enough to have access to a clamp-on ammeter and storage oscilloscope here's how to measure the current:

Step 1. You must first calibrate your scope by measuring the current drawn by a known load. I used a small room heater that was rated at 1200 watts. Pass either lead through the ammeter clamp and then turn on the device. In

my case the ammeter read approximately 10 amps. Since the current is AC it will appear as a 60 Hz sine wave on the oscilloscope screen. Adjust the vertical gain on the oscilloscope so that the waveform peaks reach the top and bottom graticules of the screen. Using the setting above, if the load you attach (such as your furnace blower motor) produces a waveform that only goes halfway above and below the center line, the motor is pulling 5 amps. If it goes 3/10 of the way above and below the centerline, the motor is pulling 3 amps.

Step 2. Set the triggering such that the sweep begins when you start the motor (when the motor begins to pull current). Set the sweep speed

Continued on page 30

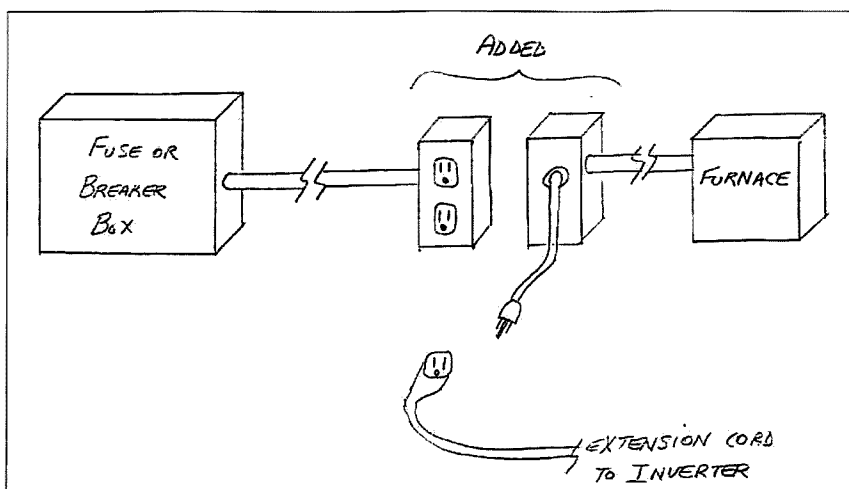


Fig. 2. Modified furnace power wiring.

Ham vs. Power Outage

continued from page 29

for approximately 50 milliseconds per square on the screen.

Step 3. Start the motor again, allowing the trace to complete one sweep. The waveform should look something like **Fig 1**. Note that the waveform is higher in amplitude at the extreme left of the screen and quickly settles to a lower value for the rest of the sweep. The higher amplitude is the starting current and the lower amplitude is the running current.

Step 4. Multiply each of the two currents by 120 VAC to get the starting and running power in watts.

The surge power capacity ratings of the inverters available from Hosfelt are roughly twice the running power capacity ratings for 1/10 second. The 1/10 second is about the duration of the surge current drawn by the motor. In my case the forced air furnace has the higher current rating of the two systems, so I

selected an inverter with 600 watts continuous/1200 watts surge. Select an inverter with a surge and running capacity higher than your motor ratings.

Using the meters on the input and the clamp-on ammeter on the output I was able to verify that the input power and output power are nearly equal. This is also proved by the fact that the heatsinks on the side of the inverter stay very cool to the touch. If it wasted any energy, the heatsinks would be warm. The power consumed isn't based on the size of the inverter. It is based on the load.

Don't scrimp on the size of the inverter. Remember, you're trying to heat your house (and maybe be a "hero" in your family). You can't do that if the inverter fails!

Rewiring your furnace

Next, you must make a simple change to the power wiring to your furnace. The furnace power is usually

hardwired to 120 VAC lines. I inserted a plug and duplex outlet "in series" with the normal wiring. This way you can either plug the furnace into the commercial power, or if the power fails, you can plug the furnace into an extension cord that connects to the inverter near your car.

First, think **SAFETY!** Turn off power to your furnace. Then use one of the new power sensors like the Fluke "VoltAlert" to make sure that the power is turned off. It is a priceless tool that can save your life if you do any work around 120 V. power wiring. The tip glows red if you get it near any live circuit. I bought mine for less than \$20 from Newark Electronics. See **Photo G**. They are also available at any home improvement store.

Here are the changes you need to make to your furnace:

Step 1. Check to make sure the power is shut off.

Step 2. Locate where the power enters your furnace.

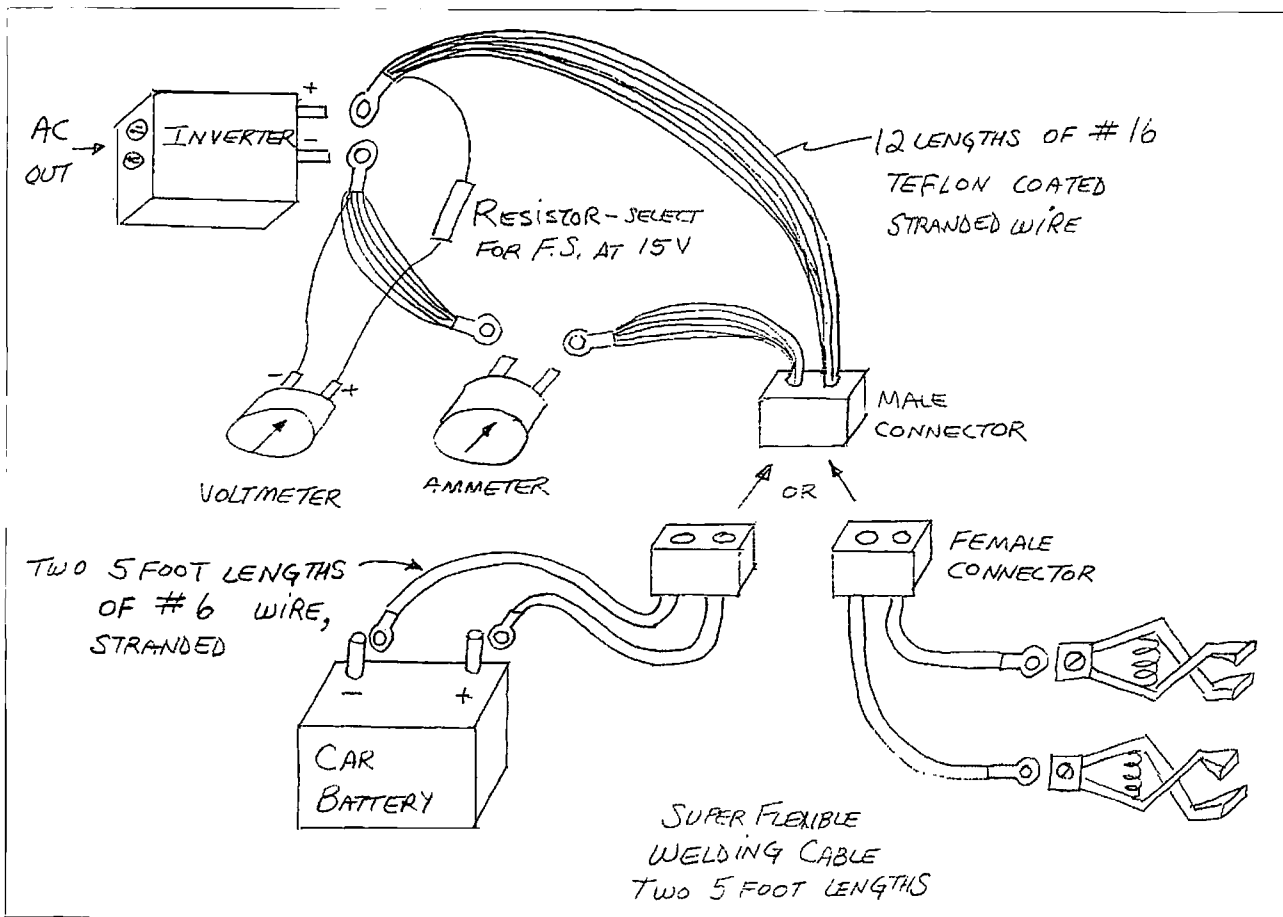


Fig. 3. 12 VDC inverter wiring.

Step 3. Cut this wire and run the wiring from the furnace into a metal electrical box mounted close to where the extension cord from the inverter ends.

Step 4. Attach a 3-conductor cord with a plug on the end to the furnace motor and furnace transformer wiring and pass it through a grommet mounted in a hole in a cover plate attached to the box in step 3.

Step 5. Mount a second metal box beside the first box. Install a duplex outlet in this second box and connect the wiring from the fuse/breaker box to the duplex outlet.

The final configuration of the work done in Steps 1–5 above can be seen in **Photo H** and is diagrammed in **Fig 2**. The break in the line that you create should be as close to your car as possible so that you can use a short extension cord.

Meters — the deluxe system

I wanted to monitor battery voltage and current draw while the system is in use. The voltmeter is used to check the general health of the battery and that the charging system is replacing the power my two furnaces draw from the battery. The ammeter is used to monitor how much current the furnace is drawing — just to make sure that everything is working as it should. (I have a little note attached to the inverter listing the current drawn when powering my furnaces — I know that during a power failure I won't remember the current each furnace pulls.)

Adding the meters will require a little more work when constructing your system, but I feel that it's worth it. You will need a voltmeter that reads at least 15 VDC full scale and a DC ammeter with a full-scale rating of at least 50 amps. I was lucky to find both at a hamfest for \$5 each.

Adapting meters of other ranges is beyond the scope of this article. An excellent article on this can be found in the October 2002 issue of *QST*, page 69. The *ARRL Handbook* also covers extending the range of meters, converting milliamp meters to voltmeters, etc. Also, see the "Test Procedures" section of any recent *ARRL Handbook*.

All soldering was done using a propane torch to heat up the terminals. Make sure all parts to be soldered are clean and use a little soldering paste or flux to help the solder bond with all parts. After the soldered junction has cooled, clean it with alcohol and a stiff brush. A diagram showing all the inverter wiring is shown in **Fig. 3**.

To monitor the AC parameters in the system, I was going to add an AC voltmeter and AC ammeter to the output of the inverter. You can see that the meters are in place but are not wired in. The AC meter can simply plug into one of the two 115 VAC outlets. The AC ammeter is a different issue. To monitor current, I couldn't find a meter that could be wired directly in series with the output. The meter I found requires a 2-ohm shunt resistor. This requires bringing the 115 VAC outside the inverter chassis so the shunt resistor can be attached to the aluminum meter panel that will act as a heatsink for the shunt resistor. I tried the shunt and meter connected with clip leads and it worked perfectly. Now that winter's almost here again I don't want to risk damaging any part of the system when we may need it at any time. Maybe next summer!

Parts: where to obtain them

The duplex outlet, electrical boxes, and conduit fittings can be purchased at any hardware or home improvement store. The 3-prong plug/cable assembly that connects to each furnace came from some computer power cables. I cut off the end that usually goes to the PC and attached it to the furnace wiring with wire nuts.

I purchased my inverters from Hosfelt Electronics. They had many units to choose from. Continuous power output ratings are: 75, 140, 300, 600, 800, 1000, and 1500 watts.

The wire can be purchased at an electrical supply house. The connectors I used came from a hamfest. If you can't find anything suitable there, try an automotive supply store.

The meters I used also came from a hamfest. The DC voltmeter should be easy to find. The 50-amp DC meter may be harder to locate. This too may

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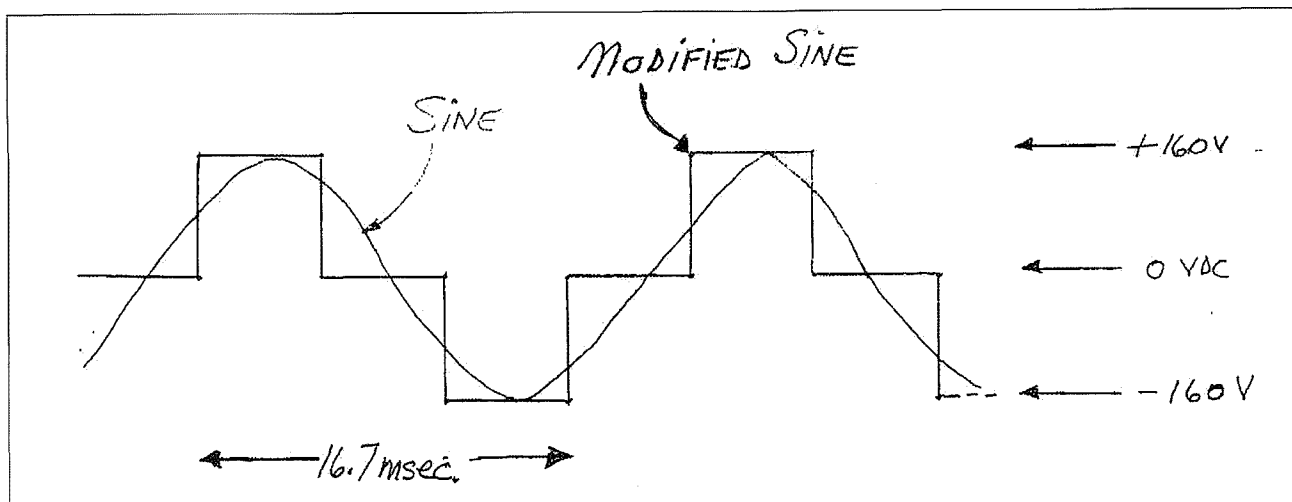


Fig. 4. Modified sine wave vs. normal sine wave.

be available at an automotive parts store. The meters aren't absolutely necessary — the system will work without them.

A diagram showing the 12 VDC input portion of my system is shown in Fig. 3.

The proof is in the pudding

So how does it work? Great! I used the system nonstop for five days during our ice storm. It kept the furnaces running and the house toasty warm. One night the temperature dipped to 18°F.

When the inverter is called into service, it's a simple matter of plugging

the connector from the car battery into the inverter, running the extension cords from the garage to the furnaces, and, finally, plugging both furnaces into the extension cords. In my house it takes me about 3 minutes to run the extension cord from each of the furnaces to the garage.

This past summer we had another power failure during a lightning storm. The power was out for about 2 hours. During that time my wife wanted to watch a certain TV show. I had the inverter up and running in about 5 minutes, she got to see her show, and when the power came back on I put the inverter back on the shelf for next time. I

also tried using a VCR powered by the inverter and it worked fine, too. I thought there might be some problem with the VCR and TV running on a modified sine wave but they worked perfectly. (More on the waveform later.) While we were watching TV, our neighbor across the street spent half an hour trying to get his generator started. He finally got it started just before the power came back on! So much for gasoline-powered generators! My inverter started right away. During the ice storm our neighbor had his generator running in the front yard. We had to listen to its dull roar all day and all night. No one could hear my inverter running.

Other information

Be aware that the extension cord carries 120 VAC power and can injure and kill just as easily as regular house power. Just because a car battery is the source of power, that doesn't mean that it's as safe as the 12 VDC from the battery! The inverter supplies many amps of current at 120 VAC.

The only difference I noticed when using the inverter instead of regular house current was that the 24 V transformer in the furnace buzzed very slightly. I believe the buzzing is caused by the shape of the output waveform from the inverter. The hot water furnace in our house is over 35 years old and the motor runs fine even after running on the modified sine wave for five



Photo 1. This cable plugs into the inverter assembly and can be connected to any 12-volt battery. The small clamps below came with the inverter.

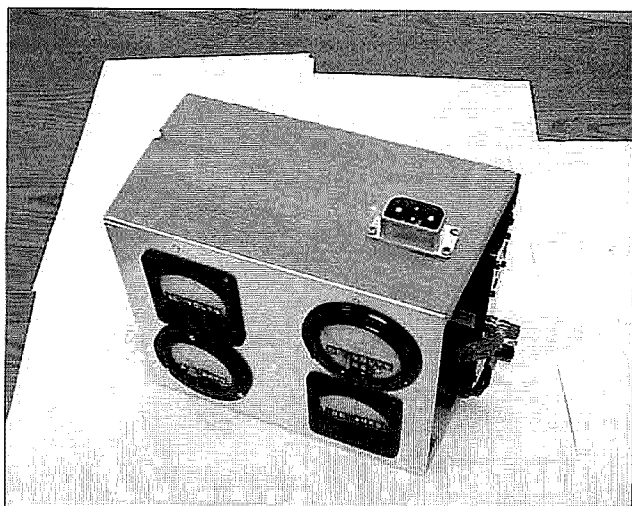


Photo J. The complete inverter assembly.

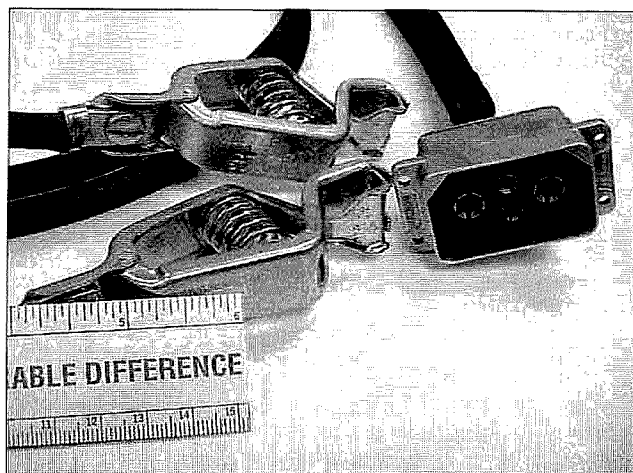


Photo K. A close-up of the clamps and connector. Note that the large connector pins are approximately 3/16-inch diameter.

days. Apparently the modified sine wave caused no damage. **Fig. 4** shows what the modified sine wave looks like on an oscilloscope. I used a 100:1 voltage divider to bump the signal down to a level suitable for viewing on an oscilloscope.

If you use a gasoline-powered generator you must refuel it every few hours, based on the size of the fuel tank. It also makes noise and smoke. The oil should be changed periodically, too. How many people remember to change the oil so the engine is in good shape for the next power failure? How many people start it once a month to make sure it will start when needed? How much space does a gasoline-powered generator take up in your garage? This inverter measures 8" x 12" x 6", makes no noise, and requires no maintenance. A gasoline-powered generator takes a lot of room in your garage or tool shed. When I need it I pull it down from the shelf. When I'm done it goes back on the shelf — totally out of the way! The car engine gets started nearly every day, I get the oil changed per the recommended schedule, and I buy the best battery available for the car — just so I'm never caught with a weak battery. Normal maintenance on your car is all that's needed for this inverter.

I built an extra set of cables so that if needed, I could attach my inverter to ANY car anywhere. These cables consist of a female connector on one end and a large set of alligator clips on the

other end. For the wire I used two 5-foot lengths of welding cable. It's very flexible and its insulation is very rugged and thick. I got it for the asking at a local welding shop. Be sure to mark the positive and negative terminals very clearly. During a power failure it's easy to get confused. This extra cable and the clamps that came with my inverter are shown in **Photo I**. They have very weak springs. I didn't feel that they would grip the battery terminals very tightly, so I replaced them with larger ones that have heavier springs.

The completed inverter assembly is shown in **Photo J**. **Photo K** shows the size of the connector and heavy-duty clamps.

Note that the connectors I used have two small and two large pins/sockets. Although one pin/socket per conductor would probably have provided a sufficiently low contact resistance, using two pins/sockets per conductor provides an even lower resistance. I jumpered the large and small pins/sockets together by wrapping thick copper straps around the solder cups then soldered them.

The downside of inverters

There were two problems we had when powering our house with an inverter. First, we couldn't run our water pump or any other large-load appliances. Second, I had to recharge the battery every 5 to 6 hours. (*We would also add that determining how long*

your car battery can be discharged before being unable to restart your car depends on many variables, and may not necessarily be 5 to 6 hours. Caveat dischargeor. — ed.)

I measured our water pump current draw at 8.5 amps surge and 7.3 amps running at 220 VAC. None of the inverters I found can supply 220 VAC or 1600 watts of power. If you're on city water, you're in luck. Flushing the toilets was a hassle because we had to drive 5 miles to my dad's house to fill up lots of old milk cartons with water. Each flush took about 1-1/2 gallons.

After several trips to my dad's house I got to talking to our neighbor, who was also without power. (A tree fell on the power line running to his house and ripped a large piece of the wall from the side of his house.) He has a swimming pool in his backyard and in the daylight the snow on the pool cover melted. This was convenient because then we only had to go next door to get all the water we needed for flushing. About the second day into the power blackout, my wife noticed that there was a nearly endless supply of very clean water from the snow and ice melting on our roof that ran out the downspouts during the daytime. For drinking water we refilled gallon jugs that originally contained drinking water from a local grocery store. (Don't use old milk jugs for drinking water.

Continued on page 59

Travels with Henryk — Part 12

Have some Madeira, m' dear?

I have been to this floating garden a few times. And I know. I will go there again. Madeira, an autonomous region of Portugal located in the Atlantic Ocean west of Morocco, is extremely attractive from my point of view. It has a variety of micro climates; abundance of fruit, flower, and fish; frequent and easy flight connections from many European cities; very active ham community; and ... it counts as Africa in amateur radio contests.

I am not the only one attracted to Madeira, and almost each week a visitor or two gets on the air “portable CT3.” Some of the local hams are very active, too.

The president of the local radio society, Luis CT3DL, is regularly on all bands, all modes, contests, DX cluster, and even on DXpeditions. I did not have a chance to visit his station, but I

visited the local radio society, ARRM. It has at least 200 members, and last time I was there I met about 10 of them (Photo A). The office is spacious — there is a meeting room, a QSL bureau, a few operating positions, and even a couple of antique radio items (Photo B).

The tradition of amateur radio in Madeira is old. I met Henrique

CT3AB (Photo C), whose father was a radio pioneer in the 1920s and was the original CT3AB. Henrique received his late father's callsign in the '70s and even managed to get his nephew Filipe interested in radio. Filipe is CT3KB now, and I met him in the club. He is



Photo A. Some members of the local radio society (ARRM), in front of their club headquarters in Funchal, Madeira.



Photo B. A well-kept vintage transmitter is displayed inside the ARRM Radio Club headquarters.



Photo C. Henrique CT3AB in his radio room.

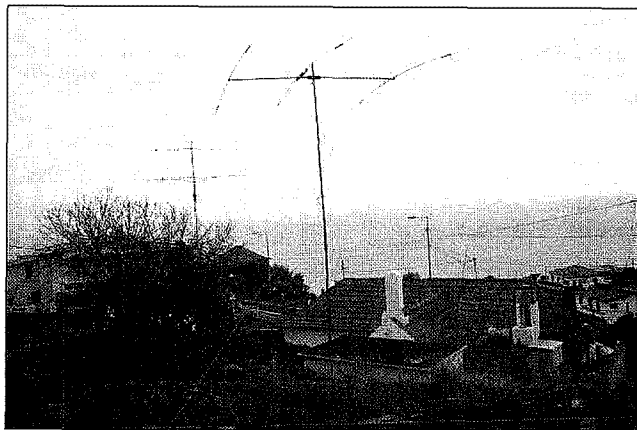


Photo D. The antennas of Duarte CT3HF.

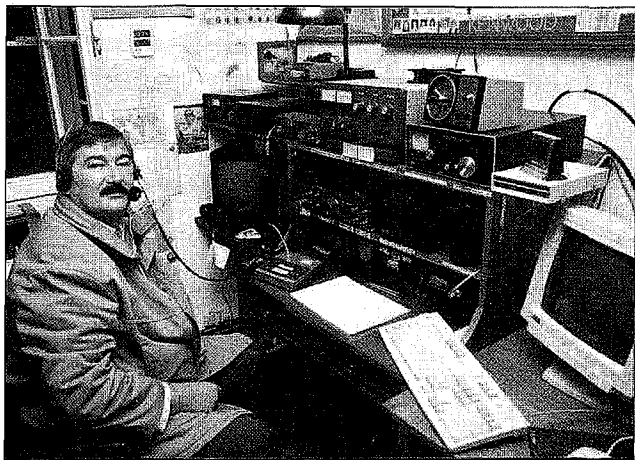


Photo E. CT3HG in his well-equipped radio room.



Photo F. Joao Carlos CT3IJ, of Funchal, has his rig and operating desk in the kitchen.

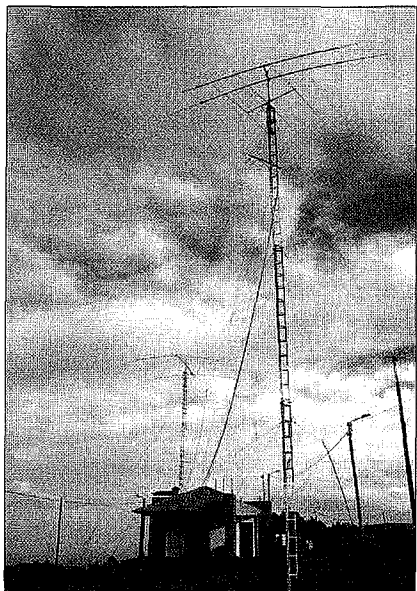


Photo G. Have you heard CT9M and CQ9K contesting from windy Santo da Serra? Here are some of their more weather-resistant antennas at the contest site — close to 2,000 feet above sea level.

second from right in **Photo A**, next to Ricardo CT3KN, first from right. Ricardo is a newcomer, too. His father used to be PY1BHJ in Brazil. Second from left is Duarte CT3HF. He is quite active and actually helped Ricardo to get involved in ham radio.

I passed by Duarte's home one afternoon and took a picture of the antennas (**Photo D**), but he was not at home so there are no photos of the radio shack. I was more lucky when I saw the large antenna tower of Jose Alves CT3HG. His station is fully furnished for HF and VHF (**Photo E**), and he has a whole room dedicated to radio.

Joao CT3IJ, who lives downtown in the capital city of Funchal, keeps his radio in the kitchen, among onions and bananas (**Photo F**). He has a decent tribander on the roof, but surrounded by TV receiving antennas.

Serious contesting in Madeira is

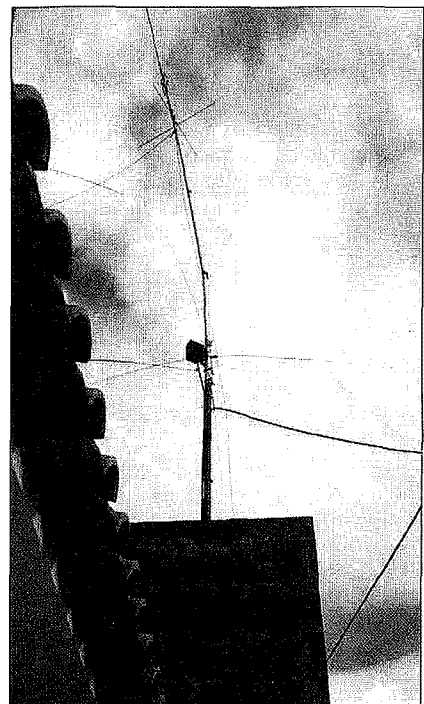


Photo H. The CS3B beacon antenna.

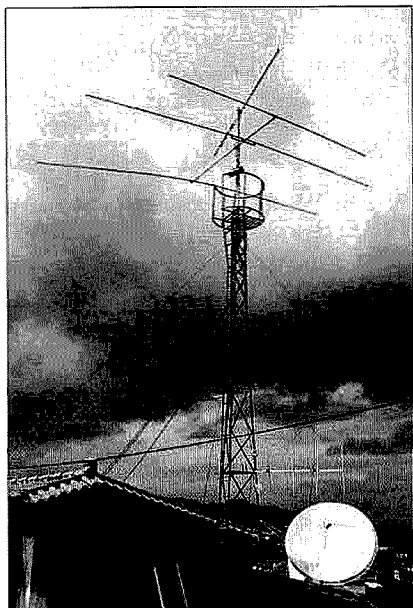


Photo I. The antennas of Joao CT3FU in Santana, Madeira.

done up the country. In Santo da Serra, about 2,000 feet above sea level, the local contest group, using calls CT9M and CQ9K, has a few permanent antennas which are shown in **Photo G**. They do erect more towers before large contests, but storms do too much damage to maintain a permanent antenna farm. The HF beacon CS3B, a

part of the global NCDXF/IARU beacon network, is located here in Santo da Serra (**Photo H**).

I drove around the island and spotted many antennas. For example, in Santana, on the northern coast of the island, I found an impressive set of yagis and a dish owned by Joao CT3FU (**Photo I**). Porto Santo, another inhabited island about 30 miles northeast of the main one, belongs to the Madeira Archipelago. The local population is only 5,000, but radio activity is high. This island is flat and not haunted by winter storms, so amateur radio antennas stay put longer. One example is the huge array of Antonio CT3BY (**Photo J**).

Better known from the air are Cedric CT3FT and Hernani CT3BX. Cedric retired to Porto Santo from the United Kingdom and is regularly on the air. Hernani is a busy person and is not often on the air but has large towers here. He became tired of perpetual damage caused by winds in the main island and moved his contesting setup to Porto Santo.

The main town of Madeira is Funchal, located on the southern coast. It is sunlit and protected from northern winds by a 6,000-foot mountain range. Of

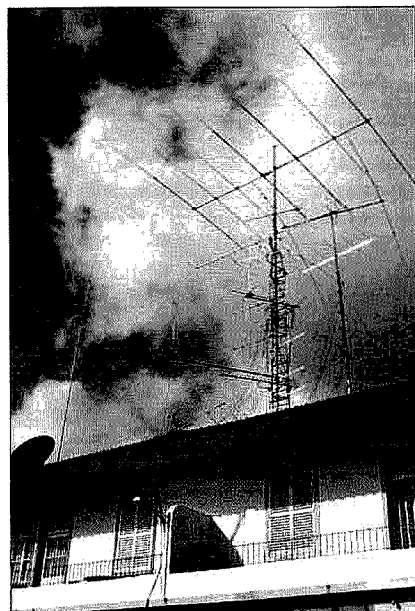


Photo J. Impressive antennas of Antonio CT3BY.

course, this very choice location is very densely populated. Many local hams live here, and most tourists stay here.

The local government of Madeira supports amateur radio in many ways. The majority of present hams were originally CB operators who have upgraded in the recent years. There is a feeling of hope for amateur radio in Madeira. 73

NEDER SAY DIE

continued from page 9

and suggesting that we should, in turn, boycott theirs, seemed reasonable. I'll no longer buy anything at Herrod's. Not even their ice cream bar. Plus don't forget their not letting our troops mass on their border with Iraq for the war.

You'll get a much clearer picture of how rotten the Saudis are if you'll do some homework. Our media, as usual, have reported little on this subject. One more cover-up. Well, the Saudis have trillions invested in American companies, so any leaking of the truth about them could result in massive advertising losses. Money talks much louder than truth with our media.

If you're interested in what living in Saudi Arabia is like, invest \$13 in *Princess*, by Jean Sasson. It makes fascinating reading. I predict that you don't even have a hint as to how awful the Saudis really are. And their country.

Keep in mind that the Saudis have been major financiers of terrorist groups.

They're the money power house behind the spread of fundamentalist Islam. This is the religion that teaches children from birth that it is their duty to kill all infidels. An infidel is anyone who doesn't believe in Islam.

Whether we like it or not, while oil may be important in the Iraq war, there are over a billion Moslems who are totally convinced that this is just another step in our war against Islam.

If you take the trouble to read the Koran and the writings of Mohammed, you'll be amazed at the calls to kill. Kill all infidels. Kill any Moslem who even questions the Koran. And this brainwashing has spread all through the Arab countries, across to Indonesia, Malaysia and to the Philippines. Plus, how many mosques are there here in America?

If you'd like to boycott Middle Eastern oil, stick to buying Citgo, Sunoco, Conoco, Sinclair, BP/Phillips and Hess.

But be sure to read *Princess*. And, after that, the two follow-up books, *Princess Sultana's Daughters*, and *Princess Sultana's Circle*. They're both \$13 and worth reading.

So what's the answer to a billion Moslems taught from birth to hate us? They want to kill us, so should we reciprocate? My preference is to outsmart them instead of trying to out-kill them.

The key is education. If we can make an alternative education available for their youngsters, we might be able to screw up Islam fundamentalism. I propose producing entertaining (and game) programs which are also educational via the Internet and on DVD which will be seductively fascinating and blindsides their fanatic clergy.

Right now there's no alternative education available to Moslem youngsters. They've no way to learn about freedom, self-determination, or religious choices. It's Islam or death.

Coffee vs. Cancer

With 90% of Americans enjoying the wake-up punch of a cup of coffee, and with Starbucks shops every few blocks

Continued on page 41

How's That Thing Really Work, Anyway?

Part 2: Transmitters.

This time we'll take a look at the basic workings of the transmitter section. Receiving is half of the fun, so now we want to generate a signal and "talk" with AB2F on 80 meters.

Previously, the block diagram showed a logical path through a typical receiver circuit, using mathematics to describe how sections function in relation with each other,

producing an audio output. Using like techniques, transmitter signals are generated, amplified, and sent to the antenna.

This time, the receiver portion of

the block diagram in **Fig. 1** has been shaded, while the new transmitter section is not. Some portions of the receiver section will be used for both transmit and receive; the VFO, audio

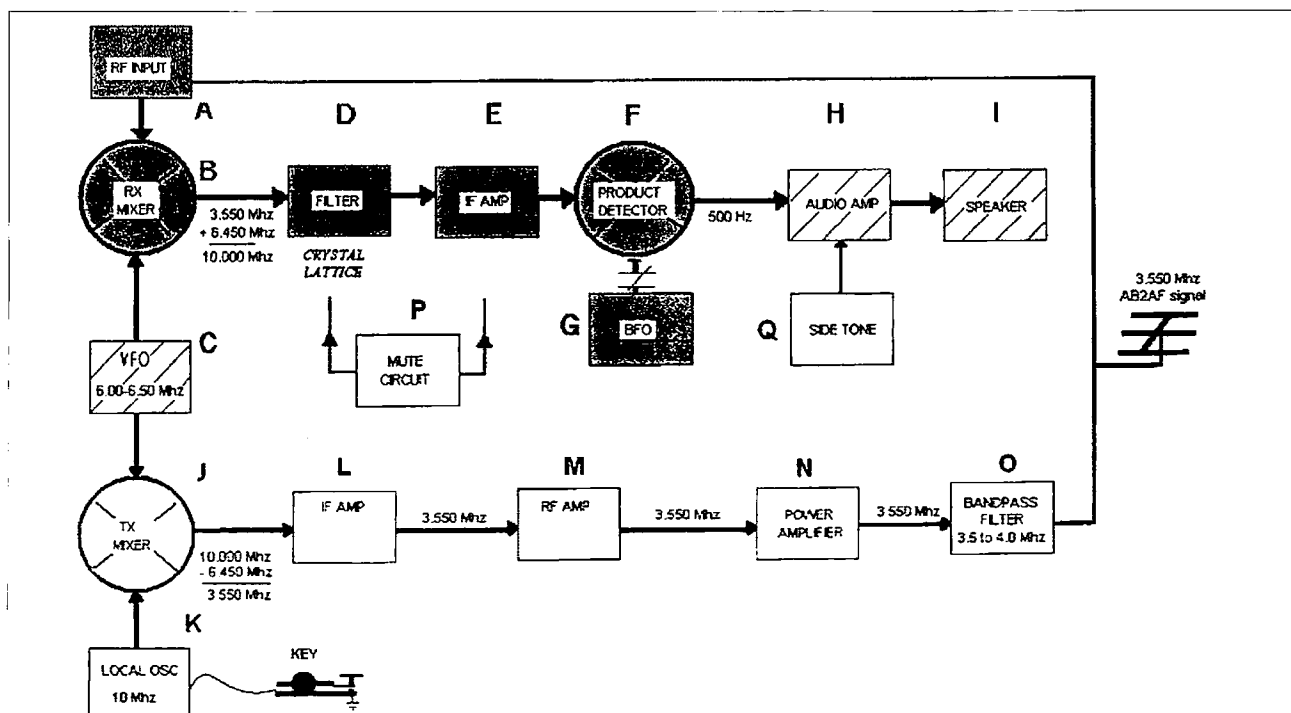


Fig. 1. A typical QRP transceiver circuit. Arrows indicate signal direction, while block "P" is used to provide DC voltage to activate the "mute" circuit.

amplifier, and speaker have lines marked across them. Using the control on the VFO (C), we have "tuned in" a signal to convert to audio. In the receiving process, the VFO and MIXER (B) used "up conversion" to mix the incoming signal with the VFO to produce a 10 MHz signal for the converting process.

The receiver must be "muted" to avoid "over amplification," and possible damage to the audio amplifier section. The receive function continues until the Morse code key contacts are closed and portions of the transmitter section are enabled. An RF signal is generated for transmission, and DC voltage circuits are added to portions of the receiver to disable the audio amplification process, (MUTE CIRCUIT) (P). At the same time another DC voltage path is allowed to enable transmitter sections. This DC voltage being allowed to act upon the transmitter and receiver circuits is often called "KEYED DC." The "switching of voltages" is needed to have the transceiver function properly. Unless the receive portion becomes "muted," the sections designed to process very low signal levels would attempt to amplify this already large signal and be erratic — not to mention provide our ears with some very loud noise.

We have disabled only that portion of the receive section that is used to process the incoming signal. Another section has been enabled, SIDETONE (Q), which will enable us to hear what we are sending. With the "front end" (blocks A, B, D, E, F, and G) of the receiver section disabled, the sidetone circuitry and audio output circuits function similarly to a "code practice oscillator."

Sound confusing? Just follow along with the block diagram as you read, remembering that new circuits have been energized while others have been blocked, and the functions to be described should become apparent to you.

Closing the key contacts makes our first dot or dash of code. The receiver is disabled and the signal from the VFO is now routed to the transmit mixer (J) for processing. We know from before that a mixer circuit processes two signals and produces a predetermined output. This second signal comes from the LOCAL OSCILLATOR (K), which has been activated by the closing of the key and activation of DC circuits.

The signal output from the LO is 10 MHz, but now we'll use the "difference" of the VFO and the LO to produce a signal on the 80-meter frequency. Previously, we changed the received signal by adding it to the VFO frequency to produce an *Intermediate Frequency (IF)* of 10 MHz.

Now the process is slightly altered to allow the VFO frequency to *subtract*

from the LOCAL OSCILLATOR FREQUENCY to produce a signal on 80 meters. This is called the *difference* method of frequency generation because the transmit mixer circuit is tuned to provide the difference between the VFO signal and the LOCAL OSCILLATOR signal, which will provide an output between 3.500 MHz and 4.000 MHz.

This weak RF signal is passed through tuned circuits to the IF AMPLIFIER (L) where it is amplified. How much amplification of the newly generated signal is a design requirement? QRP gear needs fewer stages of amplification than does a high-powered QRO rig. Sections M and N are RF AMPLIFIERS, and are there to boost the RF signal up to an acceptable level. Here we're talking basics, and because QRP is my desire, we will use only two stages of RF amplification to build the signal up to the 5 watt level for QRP operation.

Section O, the BANDPASS FILTER, has a special purpose. Its job is to pass only frequencies between 3.500 MHz and 4.000 MHz, and eliminate all others. Inductors and capacitors are arranged to electrically create a filter designed to pass only frequencies in the 80-meter band for this QRP rig. Using this filter at the output of the transmitter section removes most of the harmonic energy before the signal is applied to the antenna.

I hope this "block diagram" discussion of transmitter circuits helps you to understand the basic operating functions needed to generate a signal. "Why" circuits in your rig function are the beginning phase of understanding "how" they function. Knowing "basically" what the circuit is to accomplish, the design of the particular stage becomes a task with a beginning and an end.

This has been a very basic "trip" through a QRP transceiver's transmit section. There have been many schematics published for building equipment. Having an understanding of what sections are required to accomplish a particular task will make your construction adventures more enjoyable.

Good luck! And keep building! 73

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Amplifiers, ATU Down Converters & Hard to Find Parts

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38 73 Amateur Radio Today • May 2003

The History of Ham Radio

— part XV

There had been no changes in radio legislation in 14 years, and by 1926 there were over 700 applications on file with the Department of Commerce for radio broadcast station licenses and about 16,000 licensed radio amateurs operating in the United States.

Of special interest to all was the allocation of frequencies above 200 kc decided upon by the Fourth National Radio Conference. (See **Table 1**.)

Broadcasters had 95 available frequencies with 10-kc separation, with six reserved exclusively for Canada.

Mounting listener resentment

The listening audiences generally agreed that there were too many high-powered broadcast stations operating in the lower wavebands with too little information and entertainment of high-class value. In addition, the problem of regenerative whistles from neighboring radio sets was a bugaboo. The receivers on the market in 1926 lacked good design and circuitry development, so they oscillated and produced spurious signals. By 8 p.m. every night, when the squealers and howlers started, the time for receiver shutoffs had arrived.

Reprinted from *73 Magazine for Radio Amateurs*, June 1981, where this was originally reprinted from *QCC News*, a publication of the Chicago Area Chapter of the QCWA.

Enjoyment of radio listening began to wane.

License and frequency assignments for radio broadcasting, as well as all other associated regulation, still rested with the Department of Commerce, with Secretary Hoover in charge. As more conflicts arose, the Department's authority was seriously questioned. Several broadcasters, notably WJAZ in

Chicago, challenged the legality of the regulations pertaining to "time on the air" assignments. They asserted that The Freedom of the Air gave everyone the right to choose ... where and when he operated ... that the people of the country were the ones who had The Freedom of the Air. In consequence, the division of time among the powerful stations, known as

Kilocycles	Meters	Service
500-550	545-600	CW, ICW, phone, aircraft
550-1,500	200-545	Broadcast
1,500-2,000	150-200	Amateur phone, CW, ICW
2,000-3,500	85.7-105	Aircraft, point-to-point, mobile relay
3,500-4,000	75-85.7	Amateur, army mobile, navy vessels with aircraft
4,000-7,000	42.8-75	Public toll, mobile, point-to-point, relay
7,000-8,000	37.5-42.8	Amateur, army mobile
8,000-14,000	21.4-37.5	Point-to-point, relay
14,000-16,000	18.7-21.4	Amateur
16,000-56,000	5.35-18.7	Public toll, mobile, government, point-to-point, experimental
56,000-64,000	4.69-5.35	Amateur
64,000-400,000	.7496-4.69	Experimental
400,000-401,000	.7477-.7496	Amateur

Table 1. 1926 frequency allocations.

Class B stations, was challenged and legal action resulted.

The new radio bills

The radio legislative situation in Congress brought about important stipulations through the enactment of two long-overdue bills. The House's White Bill, H.R. 9971, one of many previously considered by committee, was finally voted on favorably March 15, 1926, placing the control of radio in the Department of Commerce. In the Senate, the Dill Bill, S.4027 (Fig. 1), introduced April 19, 1926, provided for an independent regulatory commission. These two bills went to a joint compromise conference committee, but were not acted upon until the 70th Session. The new law emerged in final form February 23, 1927, after being signed by President Calvin Coolidge and designated *The Radio Act of 1927*.

Henceforth, available licenses were granted to license-seekers on request

on the basis of priority of demand. The new Radio Act provided for dividing the United States into five radio zones to facilitate parceling out available radio channels as applications for licenses and renewals were received. It was implied that the Secretary of Commerce should make an equitable distribution of frequencies and power among the zones and issue licenses accordingly. Also provided for in the Act was the appointment of a five-member commission, one member for each zone, to constitute an advisory body to aid the Secretary in the designation of channels, etc. President Coolidge made the committee appointments on March 1, 1927.

With radio and other associated regulations still in the hands of the Department of Commerce, Senator Dill had the following remarks to contribute:

The question has arisen during consideration of the bill as to whether the regulation of radio should be entrusted to the Secretary of Commerce, or to

any other one man. It is my belief that at the present stage of development the details of administration should remain with the Department of Commerce, but that a nonpartisan commission should be established with authority to pass finally upon questions which may be referred to it by the Secretary of Commerce or anyone else. The decision of this commission should, of course, be subject to review by the courts.

In all the 14 years of radio control under Secretary Hoover, no serious criticism was aimed at his method of administration ... referred to in a passing remark by Dill. During the debate in Congress, there emerged criticism concerning one-man control with the observation that "such arrangement would give the president the final say while political opposition would be deprived the use of the ether! Control must be nonpartisan!!"

The several committees, in their long

Continued on page 59

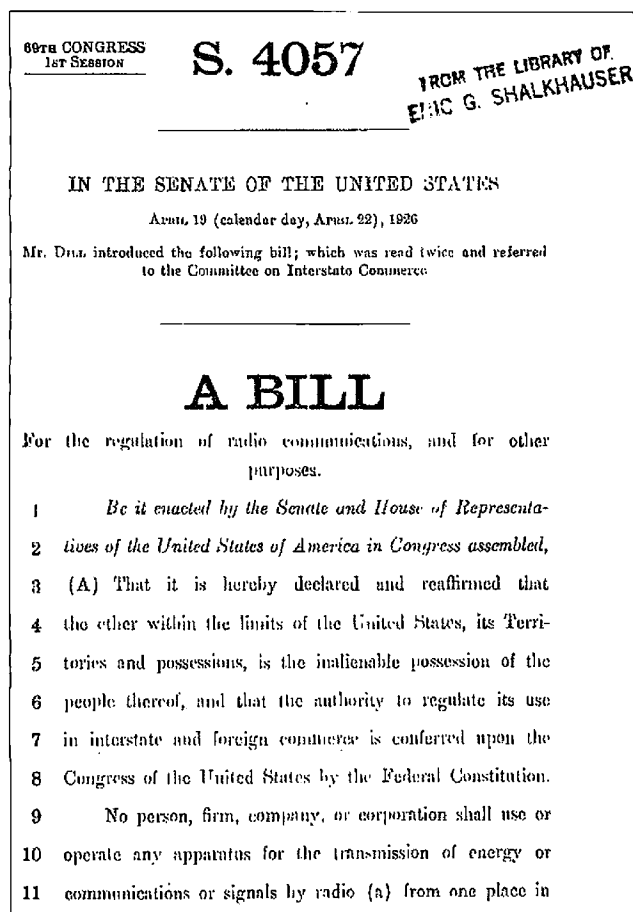


Fig. 1. First page of Dill Bill S. 4057.

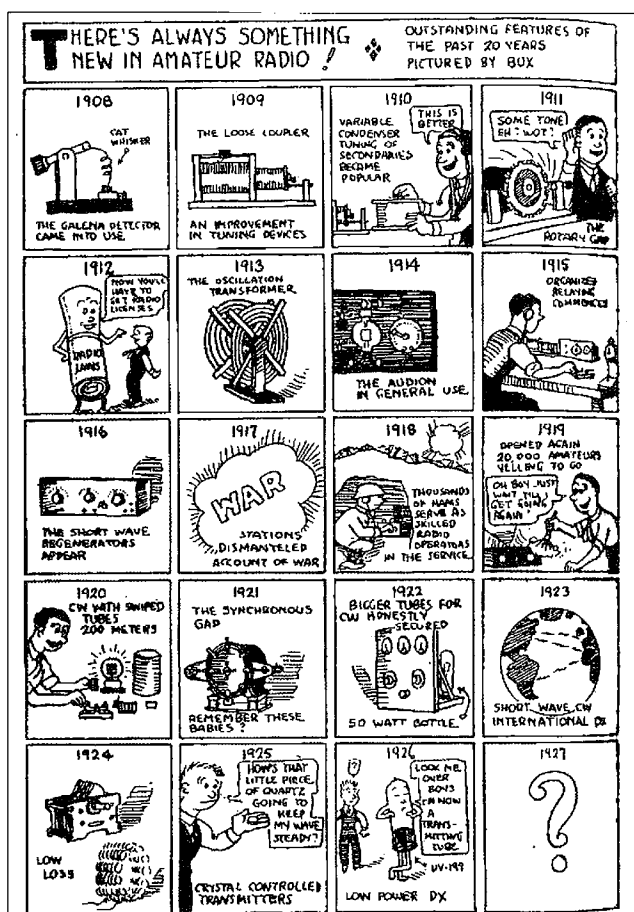


Fig. 2. Cartoon history, 1908-1926.

NEVER SAY DIE

continued from page 36

in our cities, let's keep it quiet that cancer researcher Dr. Bruce Ames says that coffee is the number two cause of cancer today.

Coffee is a mind-altering stimulant that produces a surge of nervous energy ... and then leaves you exhausted, depressed, irritable and short tempered. Caffeine stimulates the brain cortex, causing poor memory, poor balance, fatigue, anxiety, hand tremors, hostility, headaches and dehydration. Researchers claim that it takes two or three cups of water to overcome the dehydration caused by one cup of coffee.

There's also a proven link between coffee and osteoporosis, breast cancer, miscarriages, high blood pressure and raised blood sugar levels.

Those are just the short-term problems. Another chemical in coffee (methyl-xanthines) permanently alters your genes. Mutation damage of the chromosomes that will be reflected in a lowering of your children's IQs. Thus this national habit is permanently weakening our entire country and messing up our gene pool.

Ham TV on the Web

An article by G3ZHI in *Amateur Television Quarterly* on linking ham TVers and ham TV repeaters via the Internet got my interest. Alas, it was Windows-oriented, making a Mac person ready to retch.

I'd sure like to see an article submitted on how I might be able to interconnect with ham TVers and ham TV repeaters via the Web ... using my eMac and my digital Sony camera.

Picabo

Here's another chuckle from my E-mail. The famous Olympic skier Picabo (Peek-a-boo) Street is a nurse as well as an athlete. She currently works at the Intensive Care Unit of a large metropolitan hospital. She is not permitted to answer the phone because she caused too much confusion when she was answering, saying ... "Picabo, ICU."

Mature Worker Glut

Mature, meaning over 45 these days ... and workers over 45 are an increasing problem.

In 2000, there were 61 million Americans 45 to 64. By 2010, there will be 79 million ... unless more people wise up and stop poisoning themselves, in which case there'll be a lot more.

In 1960, 78% of men from 60 to 64

were in the labor force, as were 31% of those 65 and over. By 2000, it was down to 55% and 18%!

Older workers are usually much more expensive, after years of raises and increasing costly health problems, so management tends to replace them with lower-cost younger workers. I've always preferred to hire youngsters and train them. On every occasion where I've hired older workers, hoping to benefit from their experience, I've come to regret it.

So what can an older worker do?

With unskilled and blue-collar jobs moving to lower wage countries and white collar jobs being replaced by information systems, looking to large companies for jobs isn't going to make it. The answer is to start planning ahead for an early retirement where you're running your own business. This is a safety cushion in case your investments for your retirement have gone down a Tyco toilet.

My *Secret Guide to Wealth* goes into detail on how to get someone else to pay you learn everything you need to know to be a successful entrepreneur ... and how to pick a product or service for your business.

Our country could use a couple million more small businesses and fewer giants.

Drug Promotions

For the few of you who may have wondered at how high drug prices are, it may help you to know that promotional spending on drugs is currently \$19 billion. That's with a B ... for golf outings, ski trips, dinners at posh restaurants, and so on. Does all this influence prescription writing? You bet your sweet bippy it does.

Prescription costs have risen at twice the inflation rate for the last five years.

In Vermont, Medicaid spending for prescription drugs went from \$40 million in 1998 to \$115 million last year.

My mantra is simple: Stop poisoning your body and you won't need a doctor or medications.

Last fall, TAP Pharmaceutical settled charges of kickbacks and lavish gifts to push Lupron by paying an \$875 million fine.

AIDS Deaths

George Will recently wrote in *Newsweek* about the world's AIDS situation. He said that 25 million have died so far, and 65 million are currently HIV-positive. He didn't mention anything about how AIDS got started. A book by Dr. William Douglass puts the epidemic at the hands of the Center of Disease Control in Maryland, where he says it was developed. It was then deployed with vaccinations in sub-Saharan Africa

to counter their huge birth rate and among the American gay community for some other reason.

Please, if you know of any way to reach George Will, let him know that the AMA, and probably the FDA and NIH, have been covering up an inexpensive no-drug cure for AIDS for over ten years. One that was granted a patent in record time. This is a cure that could save those 65 million lives and would have cost less than a dollar a life.

Dr. Bruno Comby discovered another cure for AIDS as described in his book, *Maximize Immunity*, which was published in 1994. More recently, Dr. Lorraine Day rediscovered the Comby approach.

Why all the cover-up? Money. Drug company profits.

TV Advertising

Though cable, satellite, movie rentals and DVDs may be luring viewers from the networks, they're doing just fine. NBC had \$2.7 billion in ad revenue for last spring's season. The six-networks total for the season was \$8.2 billion.

Yes, there are more ads. Ten years ago the non-program time for prime-time network shows was 13-1/2 minutes. Now it's over 16-18 minutes! That's why it's taking me longer to fast-forward through all those commercials. I watch nothing live, so I watch *60 Minutes* in 42 minutes, and watch the Nexium and car ads endlessly whiz by.

In 1980, the three networks shared 90% of the viewers. Today the six networks are sharing only 56%.

If I'm able to get the word to the public about changing our lifestyles, the loss of drug and food advertising could just about wipe out the networks. Gee, what a loss!

Meanwhile at present an ad on *Friends* runs about a half a million dollars. *CSI* is a quarter million, and 8 *Simple Rules* an eighth of a million.

The IQ Mystique

As a founder of American Mensa I can write with some authority about Mensans. I've known hundreds of 'em and met thousands. For the most part, what a bunch of ignorant losers!

When a journalist asked a New England Mensa official to suggest a successful Mensa member he could interview, the official was stumped.

Just as a high speed computer with lots of memory is useless without data, so are our brains. Reading the sports pages and watching ball games (base, basket, foot, soccer, golf, tennis, bowling)

Continued on page 62

Putting 24-Volt Microwave Devices to Use

Since the September 2002 column covering microwave relays, I have received a few questions on adapting 24-volt microwave relays to use with 12-volt-powered systems. This seems to be a common problem in that 24-volt relays seem to be popping up at swapmeets in increasing numbers.

While several dealers have the advertised 24-volt relays for a pretty good price, their 12-volt counterparts are even more costly, straining the experimenter's budget. In that regard, pick up those inexpensive swapmeet 24-volt miniature SMA relays and use them on your upper microwave frequencies. They exhibit great isolation and will handle moderate power for many transceivers, even the likes of my 10 watt TWT amplifier for 10 GHz.

There are several versions of miniature SMA relays, from the basic SPDT switch, which seems to be most common, to the more exotic latching type of relay. The difference between them externally is almost nothing. Internally, the difference is quite a bit. In an SPDT type, there is only one relay coil internal and the normally make

contacts are common to one side of the relay with the coil not energized. When energized the relay switches from common to the other side of the switch and stays in this position until the relay coil power is removed.

In a latching relay, common is tied to one side in a make condition and this side depends on which set of coils were toggled first. It has two internal coils and they, when powered individually, put the switch in position 1 to common or position 2 to common depending which coil is powered. Power (current) flows momentarily, as when the coil is powered to latch the selected position a cutoff switch internal opens the coil from power and no further current flows in the circuit. The second coil in the scenario makes its previously open coil

closed to the power pin on the relay body and awaits the application of DC power to reactivate the second coil to make condition.

The switching of a latching relay is simple. It actually just requires two power leads, one for receive and one for transmit. In receive, common and left (1) contact is made in receive, and when transmit DC is applied to the second coil, the relay switches to the transmit common part of the switch, making the receive contact open from common.

But now the major problem to be discussed here is how to use 24-volt relays from 12-volt DC sources like in mobile or remote Field Day operations. Of course, you could power your equipment from a 24-volt battery source, but that requires carrying an extra battery for operations.

Electrically speaking, what can be done to accommodate this power problem, allowing utilization of surplus/used 24-volt microwave relays to adapt them to 12-volt power systems? There are two solutions. One requires construction of a bucking voltage doubler, or you can add a miniature surplus switching power supply on top of the 12-volt control switching relay power line. In actual operations, the latter is simple if you can obtain such a power supply. In surplus scrap yards that break down computer and other electronics, they have been found in reasonable quantities, allowing for use in such an application.

These switching power supplies are quite common and might have been overlooked for many applications. They are quite small, being about the size of two postage stamps and one quarter of an inch high. While there are many that are rated for various voltage inputs and outputs, the ones that seem to be just what we desire are the ones that operate from +12 volts input and deliver +5 volts

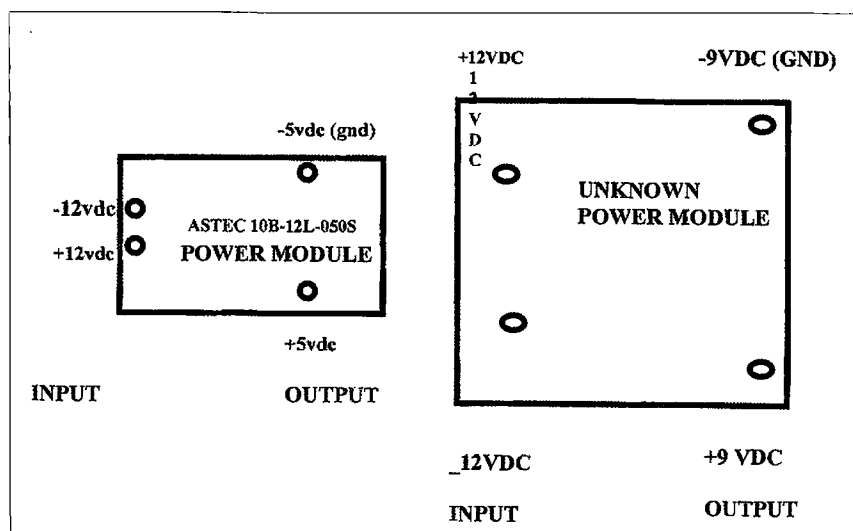


Fig. 1. Top view of power supply modules showing pinout connections for both the Astec 5-volt isolated supply and the unknown 9-volt isolated switching power supply modules. **NOTE:** Both modules use input pins spaced closer together than the output pins, possibly a standard configuration.

output. Most of these can handle at least 5 watts of power output at 5 volts and can be used normally or inverted for negative power requirements.

That is because the output is not just a voltage regulator internally but a complete switching power supply whose input is totally isolated from its output. This is what allows powering up the primary to ground and +12 volts and taking the negative 5 volts and making a direct connection to the +12-volt DC lead. Now at the positive 5-volt lead you have +17 volts available. Connecting two of these in series gives you 22 volts. That's 12 volts from the primary power source, and with two 5-volt isolated power supplies in series each adding 5 volts to the picture, now a total of 22 volts. With mobile operations with a charging 12-volt battery source, it will up the voltage on these connections to 24 volts as the charging 12-volt battery nominal is now +13.9 or so.

Why 5-volt switching power supplies? Well, they're the most common to provide +5 volts DC for logic power on PC boards. While there are other voltages that fill the bill, the 5-volt switchers seem to be the most plentiful. One other possibility that I located quite some time ago was +12-volt input and 9-volt isolated output switching power supply in a square package. There was no label, but you could be sure it's a switcher as it had only 4 leads internal to the sealed epoxy package and resided on the DC power supply shelf of the scrap PC board it was harvested from. Once I recognized it for what it was, many more were obtained, as I knew what to look for, label or not.

Most part number schemes seem complex, while some are not. Take, for example, a surplus Astec power switcher with a label of "AA10B-12L-050S". While I don't know the total information on this unit, it has been observed that it's +12 volts input and 5 volts isolated output. I have stacked one power module on top of a 12-volt DC line, and with the 17 volts have been able to use with assurance many 24-volt relays without further modification.

Another great application is the generation capabilities of using this power module in an inverted power connection for FET bias supplies. This allows you to use lower voltage DC positive drain power source and



Photo A. Shows both the Astec 12-volt to 5-volt isolated power module and the unlabeled 12-volt to 9-volt output power module I was able to find for use in powering 24-volt relays from 12-volt supplies.

a negative 5-volt supply from the switcher for gate FET bias. Of course, further circuitry is necessary in any FET power supply circuitry, but the basics are there for both positive- and negative-generated voltages for operations.

Testing the power module that did not have a label and put out 9 volts isolated on the secondary of the switcher, I found that with a 75-ohm load it was still loafing along at 125 mA draw. Testing it with a 24-volt relay that drew 95 mA, the unloaded power supply was 22 volts and did not change a tenth of a volt when power was applied to the 24-volt relay. It operated quite well on 22 volts, as I was watching contact closure for relay operation with a simple LED-driven test circuit I use for coax relay contact testing.

That's just another simple project for testing miniature SMA relays that is constructed out of some scraps of SMA connectorized coax cable and tied to two LEDs operating

on low voltage for watching contact closure of the relay. I built it as, being a scrounger and finding a relay that was defective, I could use this simple tester to verify if and when I obtained contact closure and repair on a few relays. It was easier to use this simple test setup than to hold a VOM set of test leads. Most relays I have found defective had dirty contacts internal to the relay. If you can pry the cover off without destroying the relay, through some simple maintenance repair you too might get lucky in the salvage of a defective SMA microwave relay.

Well, that's it for this month's tip of the day. Don't scowl on the next batch of SMA microwave relays just because they're marked 24 volts only. Take advantage of these 24-volt relays, be they an SPDT or latching or even the harder-to-find transfer (four-contact) relays. As always, if there is any question please address me at my e-mail address and I will answer your question ASAP. Best 73, Chuck WB6IGP. 73

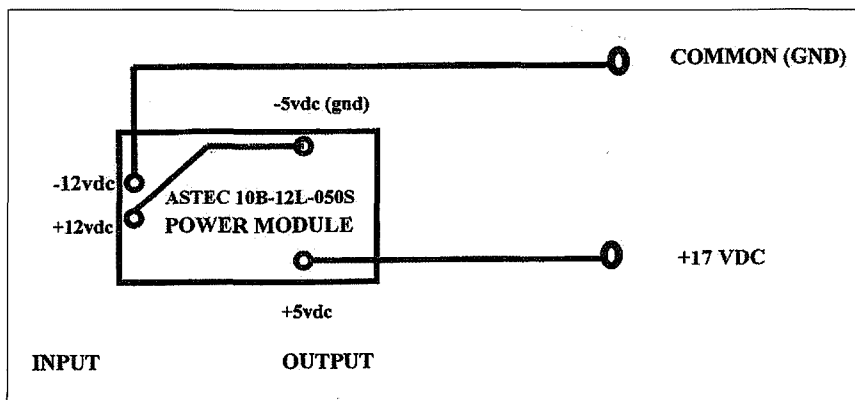


Fig. 2. Application of switching power supplies added in series to input 12-volt positive supply to generate higher voltage allowing use of 24-volt microwave relay operation from simple 12-volt power sources. Be it the 5-volt addition to the 12-volt supply or 9-volt secondary outputs, both worked well on 24-volt relays I tested in my junk box.

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Resources Review

Last month we asked some questions: "How many satellites can you keep up with?" and "How many can you work in a day?" We've come a long way from the days of, "Have you been on the satellite lately?" Now you hear: "Been on SO-50 this week?"

The answer might be, "What's SO-50?" There are so many hamsats and modes, that even among a local satellite group, members could be extremely active via the amateur radio satellites, but never make contacts with each other. Rather than getting stuck on one satellite or mode, investigate the others. You will be surprised at what's out there waiting for you.

Info sources

Even with the Internet, it's still a challenge to gather all of the information needed to explore a new satellite or mode. If your

focus has been FM contacts via UoSAT-OSCAR-14 (UO-14), getting on a 9600-baud digital hamsat might seem daunting. You may have an understanding of orbital mechanics, at least enough to guess when UO-14 will be around tomorrow, but the last time you listened to a 9600-baud satellite, all you heard was a bump in the noise on the FM downlink. What about SSB (single sideband) contacts via the Fuji satellites, or SSTV (slow scan television) via the S-band downlink on AMSAT-OSCAR-40 (AO-40)? Your satellite "Elmer" may have gotten you started, but it's up to you to explore new horizons.

After the initial Internet "Google" search for everything you ever wanted to know about a particular satellite or mode, you may realize that there are holes in the data, or it makes too many assumptions about your base knowledge. The local satellite net doesn't mention anything and the magazines are off on some other tangent. It's time to hit the books.

The printed word

At a recent ham convention, I checked out the offerings at the AMSAT booth. I saw some new

patches and stickers, but the booklets and books looked like the same thing I had seen a year earlier. I asked about this, and got an answer that caused me to buy almost one of each of everything on the table. AMSAT has made it a policy to study the status of all of their publications every year. They look for things that have changed and new topics that need coverage. The authors provide updates and the new version of an old favorite is ready to go for the Dayton Hamvention in May. All AMSAT items are available via the Web site, [www.amsat.org]. Near the bottom of the front page is the link to "AMSAT Catalog." From there you will find the current offerings and prices with differentiation for domestic and foreign shipping.


Working the Easy Sats

This is an introductory booklet by Gary Rogers WA4YMZ. At 33 pages, Gary's guide is inexpensive (\$6.00), but invaluable for first-time hamsat chasers. Gary's reason for writing this material for AMSAT was simple: He simply wanted to share his experiences of getting on the air via satellite with others. "I did it. You can, too. Come join the fun!" Contents range from a description of the types of amateur-radio satellites, definitions of terms, and special considerations, to how to set up a station and achieve success. Gary also includes sections on what to do after the QSO, expanding to other satellites, further resources, and final thoughts. If you are just getting started, this is the place.


The Analog Satellites Operating Guide

G. Gould Smith WA4SXM has been a strong AMSAT supporter for decades. His analog satellite guide is an in-depth

WORKING THE EASY SATS



**An Informal Introduction to the
Amateur Satellite Program
plus
Hints on Using the More
Easily Accessed Satellites**



by
GARY B. ROGERS, WA4YMZ
AMSAT 16961




Photo A. For newcomers: Working the Easy Sats.

The Analog Satellites Operating Guide

UO-14, AO-27, SO-41, RS-12/13, RS-15,
FO-20, FO-29, AO-10, AO-40 and ISS

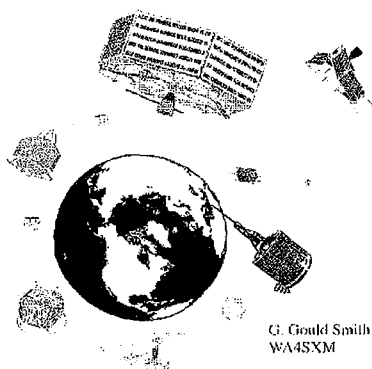


Photo B. Analog satellites for everyone.

information source for anyone who wants to check out analog modes (FM, SSB, CW, etc.) via the hamsats. According to Gould, there is a three-tier amateur satellite upgrade path. On the analog side, it starts with FM voice via satellites like UO-14, but also includes voice communications with the International Space Station. Level two adds SSB/CW communications through satellites such as Fuji-OSCAR-29 (FO-29), while the top level includes AMSAT-OSCAR-40 (AO-40) work with its 70-cm (Mode U) and 23-cm (Mode L) uplinks in conjunction with the 13-cm (Mode S) downlink. With this 100-page book, you will get satellite profiles with frequencies of operation, telemetry information, operating guidelines, and information about tracking software. At \$15, it's an excellent resource.

The AMSAT-NA Digital Satellite Guide

WA4SXM isn't just a master of the analog satellites. His interest in telemetry, which is usually quite digital, has led him to expert status via the digital hamsats. He once again applies a three-tier upgrade path for the digital enthusiast. Beginning with two-meter FM packet and advancing through ISS, Gould explains equipment requirements and how to achieve digital

success. Level two goes further with 1200-baud UoSAT-OSCAR-11 (UO-11) telemetry decoding, 1200-baud AMSAT-OSCAR-16 (AO-16) communications, and details on 9600-baud FM work through such satellites as UoSAT-OSCAR-22 (UO-22). For the dedicated few wishing to go further, there's level three with UoSAT-OSCAR-36 (UO-36) transmissions at 38.4 kbaud and the RUDAK digital system via AO-40. Gould goes into great detail on how to use available digital-communications software like WiSP (Windows Satellite Program) by Chris Jackson ZL2TPO/G7UPN, and provides further insights for tracking systems, including unattended automatic operation. This is another excellent resource, and with 100-plus pages, well worth the \$15 from AMSAT.

Mode S — The Book

Some folks aren't satisfied with off-the-shelf, plug-and-play radio systems. Ed Krome K9EK is one. His *Mode S* book has been updated to include many experiments and options for those pursuing the 2400 MHz downlink signals from AO-40. Useful *Mode S* made its debut on AMSAT-OSCAR-13 (AO-13) many years ago. It was surprisingly easy to make contacts even though the downlink gear on the satellite

The AMSAT-NA Digital Satellite Guide

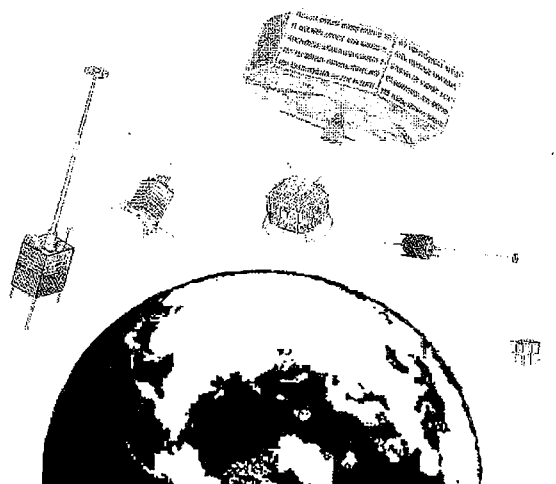


Photo C. Digital hamsat info from simple packet to high-speed satellite communications.

was low power and used only a small helix antenna. Ed has been building S-band receivers, downconverters, and antennas ever since. His 134-page book includes examples, photos, schematics, circuit board layouts, and parts lists for his most successful projects. It's like a catalog of things to try and devices to build for better AO-40 communications, both analog and digital. It's \$15 from AMSAT.

December 1974 AMSAT Newsletter

For \$5, you can get a copy of the best source of data about AMSAT's oldest operational satellite, AMSAT-OSCAR-7. The December 1974 *AMSAT Newsletter* was printed just after a successful launch from Vandenberg, California, on November 15, 1974. The newsletter is a 36-page small-format (8" x 5.5") "zine" full of historical AMSAT material in addition to details about the spacecraft. It's not mentioned on the Web site, but AMSAT has copies at their main office for those who ask.

Other books from AMSAT

Every year AMSAT, compiles the proceedings from their space symposium. Those who attend get a copy. AMSAT usually has a number of extras that are made

Mode S

- The Book -

2001 AO-40 Update

The complete guide to operating
Satellite S-Band

by Ed Krome K9EK

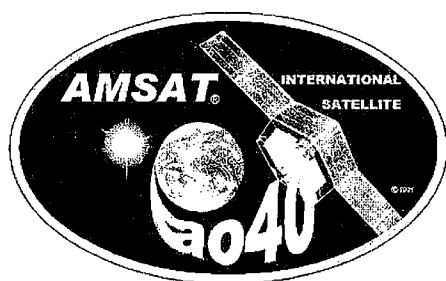


Photo D. Everything you can imagine about hardware for 2400 MHz satellite reception.



AMSAT

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NEWSLETTER

Issued quarterly by the Radio Amateur Satellite Corporation

Volume V3

Number 3

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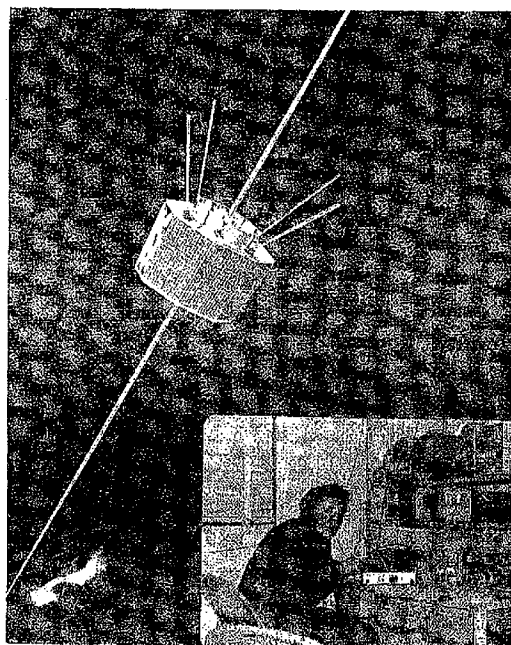


Photo E. The AMSAT Newsletter from December 1974 tells all for AO-7 activity.

available via the main office and Web site. As publisher, the American Radio Relay League (ARRL), also has copies for sale. It is an excellent source of information about new project proposals, studies on current experiments, and other appropriate topics. Length is typically 120–160 pages; it is professionally bound, and sells for \$20.

Although not an AMSAT book, *The Radio Amateur's Satellite Handbook* by longtime AMSAT member and supporter Martin Davidoff K2UBC is considered the best all-around source of information about amateur-radio satellite efforts. Last updated in 1998, it sports 370 pages of information and retails for \$22 (\$25 postpaid from AMSAT).

For those who are new to amateur radio satellites, the introductory section provides a nicely detailed view of the program's history starting with a perspective on *Sputnik 1*. Schematics of the first *Explorer*, *Vanguard* and *OSCAR 1* beacon transmitters are included. The complete chronology of the OSCARs, and the many volunteer hams who built them, is fascinating. The book continues with operating notes on satellite activities, information resources, descriptions of international organizations, conferences, the AMSAT local area coordinators network, satellite schedules, and the involvement of the ARRL. The two final chapters of the book describe various satellite onboard systems, and what it takes to actually build a ham radio satellite. Topics include propulsion motors, power sources, onboard computers, radio links, thermal concerns, mechanical considerations, and launch opportunities. This handbook brings hamradio information and operating practices together with an insight into the history of OSCAR and possibilities for the future. It's a good investment.

Other books

The ARRL has two other books of interest including *The ARRL Satellite Anthology* and of course *The ARRL Handbook*. The *Satellite Anthology* is a compilation of articles from the ARRL's magazine, *QST*, from the 1990s. Hamsat information in *The ARRL Handbook* is updated yearly to ensure that it is current and useful. While many of the best items have already been publicized via AMSAT, there are also offerings that have been developed by ARRL authors and staff [www.arrl.org]. Another book of note is the *Space Radio Handbook* by John Branegan GM4IHJ, produced by the Radio Society of Great Britain. Although published in 1991, this book has many sections of timeless material dealing with the physics of satellite orbits, meteor scatter, moonbounce, asteroid and comet signal reflections, radio astronomy, and even lunar beacons. Finding a copy may be difficult since it is no longer in print, but it will be worth it if a copy can be located [www.rsgb.org]. AMSAT-UK (United Kingdom) recently published an updated version of their own *Guide to OSCAR Operating*. Although the focus is mainly for newcomers, the color illustrations and detailed charts make it useful for everyone [www.amsat-uk.org].

More information

Don't forget magazines. The Hamsats column has been continuously supported by 73 since January, 1987. Other periodicals like *QST*, *CQ*, *World Radio*, and others have had their own versions of satellite columns and article support. One of the best hamsat periodicals is *The AMSAT Journal*. It is published bimonthly by AMSAT for current members. Membership is \$36 per year for U.S. residents, \$41 for Canada and Mexico, and \$45 elsewhere. As the organization's communications link with their membership, the

Continued on page 59

D700 Keyboard Interface for the Kenwood TMD-700A

One of the most interesting aspects of ham radio is the fact that you can start with a great product with great features, but soon some ham will figure out a way to make it much better. The Kenwood TMD-700A is one such great product, and the D700 Keyboard Interface from John Hansen W2FS makes it even easier to use.

Kenwood's TMD-700A offers a dual-band radio with a built-in TNC. Not only does this make packet radio possible, but also the built-in software makes APRS (Automatic Position Reporting System) a natural.

Generally, this tends to be somewhat of a one way street. I know that people can spot my location as I travel, and I do see other APRS stations pop up on the display. However, it is impractical to watch the screen while driving, and totally impossible to send a message. The TMD-700A has limited controls, so sending a message involves either punching in the text with the microphone or using the front panel display. While both methods are possible, each is somewhat time consuming. The microphone method utilizes each key for several letters, so you must press a key repeatedly. To enter the "@" sign, integral to every e-mail address, it takes 18 presses of a button. The control panel method is like an old labelmaker: Spin the dial until you get to the correct letter, then press a key. As the old expression goes, "There must be a better way!"

The D700 keyboard interface makes operation of the radio in packet or APRS quick and easy. Since the D700 uses DTMF tones to transmit a letter from the microphone to the radio, John decided that it should be possible to build an interface that would allow a standard computer keyboard to be connected to the radio utilizing the microphone port. By generating the correct tones, it would be possible to convert the alphanumeric keystroke to the DTMF tone that would enter the correct letter into the radio. Of course, converting a theory to a practical use is more than just coming up with the idea. The trick was to determine how to

emulate the signals generated by the microphone. Fortunately, Kenwood was very helpful in providing John with information to make this possible.

The keyboard interface can be purchased either as a kit or assembled and tested. There are only about 35 components, including the connectors, so construction should not present a challenge for most hams and will save you a few dollars. Of course, if you have small children who insist on participating in your every endeavor as I do, you may prefer to purchase the unit complete.

If you do decide to build the kit, a few of the usual recommendations are in order. Check the circuit board carefully for broken traces or solder bridges before you begin; it's much easier to replace the board before you start construction than after. For those of us who haven't had laser eye surgery, a magnifying glass may be a useful tool.

As always, check to make sure you have all the parts. An empty egg carton can be very useful for sorting parts, although some people use a corrugated box for some components like resistors. Place one lead into the honeycomb of the cardboard edge and write the component value just below.

Before beginning to construct the interface, a few decisions must be made. It is possible to install a switch and LED on the circuit board. If you are planning on installing the circuit board into a case, you may want to install these on the case itself rather than on the circuit board. The switch and LED are optional, depending upon how you plan on using the device. If they are used, the unit will power itself down after three minutes with no activity. If you plan on powering this from a 9-volt battery, this feature is

Continued on page 59

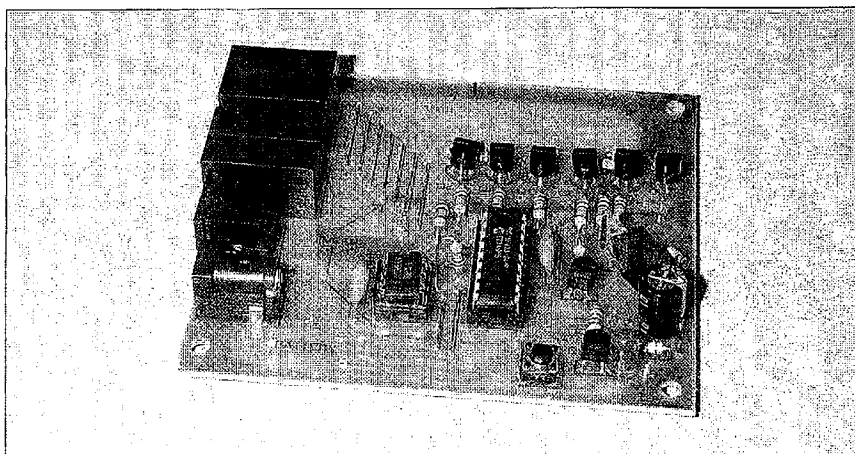
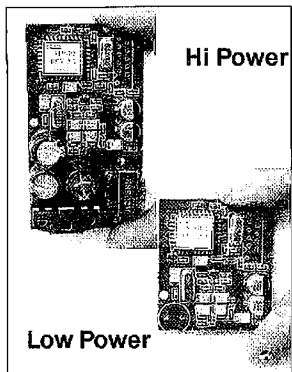


Photo A. Want to be able to easily send text messages on APRS with your Kenwood TMD700A? With the D700 interface you can connect a PS/2 keyboard.



SGC Announces ADSP²

SGC Inc. is pleased to announce ADSP², an unprecedented improvement in Automatic Digital Signal

Processing. Beginning on March 1st, SGC has made available ADSP² for its own SG-2020 Transceiver and as an add-on for nearly any transceiver — old or new — that meets minimal specifications for the receiver audio circuits.

SGC pioneered Automatic Digital Signal Processing (ADSP) more than 10 years ago. ADSP² pushes ADSP performance to the extreme performance limits of modern DSP processing technology. Internal IF-based DSP is incapable of matching the performance of ADSP² because it must devote some processor time to other

tasks. ADSP² devotes all of its time to spectral noise reduction, yielding unprecedented performance exceeding that available in top-of-the-line transceivers.

SGC has tested the ADSP² in many popular transceivers, including small portable units, and found significant improvements in noise rejection on every unit evaluated. The ADSP² board adds two levels of ADSP processing and three narrowband filters, giving the user significant flexibility in choosing the processing most appropriate to the conditions.

ADSP² is supplied ready for

installation with only a few simple connections and full instructions for various transceivers. It can be installed by the user, by a dealer, or returned to SGC for installation. Retail cost for the ADSP² board is \$180 with a \$49.95 charge for installation when done by SGC. SG-2020 owners may upgrade the ADSP² for \$120 until 30 June 2003, after which the cost will be \$180. All SG-2020 upgrades will be done at the factory.

Additional information is available at the SGC Web site at [www.sgeworld.com] or by phone at 1-800-259-7331.

New Technician Class Book Reorganizes Everything

Gordon West WB6NOA has announced his new Element 2 Technician class study guide valid from July 1, 2003, through June 30, 2007. This new book reflects all 511 Element 2 Technician class questions and answers released by the National Conference of Volunteer Examination Coordinators Question Pool Committee. Every question and answer is followed by "Gordo's" unique and upbeat description of the correct answer.

West explains that one of the most important features of this new book to better help new ham applicants study questions in a more logical progression:

"When the 4-member Question Pool Committee revised the old Technician class question pool, many of the subject areas were separated and moved out of place from a logical teaching plan. The QPC question pool jumps right into questions about privileges and radio bands, yet the applicant won't see questions on what an actual radio wave is until nearly halfway through the pool. If someone were just to study the question pool in the order of how the 511 questions appear from the QPC, they are simply memorizing how to pass the test and missing the important aspects of how that particular test question works into the real world of operating ham radio." West is well known for his teaching methods through his weekend amateur radio training classes offered throughout the country.

The new Gordon West Technician class book has completely reorganized the entire question pool for Technician class in a logical progression for learning and teaching amateur radio in both the classroom as well as home study. Chapters:

- What is ham radio? (6 Q & A's)
- What it takes to earn a Technician class license (over a dozen Q & A's)
- All about Technician class callsigns (a dozen Q & A's)
- Where you may operate your new ham radio (almost a dozen Q & A's)
- The responsibility of being a control operator (a dozen Q & A's)

- Allowing a third party to talk on your radio (almost a dozen questions)

- All those no-code privileges (a dozen questions)
- The excitement of operating repeaters (over 2 dozen Q & A's)
- More line-of-sight excitement, including space, moon, data, and radio control (a couple dozen Q & A's)
- Understanding wavelength and frequencies (a couple dozen questions)
- Procedures for going on the air, and rules (a dozen questions)
- In an emergency ... (a dozen questions)
- Going on the air with your new license (many questions)
- Technician added privileges with code (more than a dozen Q & A's)
- Understanding propagation from beacons (a couple questions)
- Basic understanding of volts, amps, resistance, and watts (lots of questions)
- Circuits within your new radio (lots of questions)
- Understanding bandwidth (a dozen questions)
- Stay away from TVI (a dozen questions)
- Low PEP works fine (less than a dozen questions)
- Understanding antennas like the dipole and beam (many questions)
- Know your SWR (less than a dozen questions)
- Putting up your mast and tower safely (a dozen questions)
- Staying safe around radio frequency energy (many questions)

The new Gordon West Technician class Element 2 class and home-study training book is available from all amateur radio dealers, and also available in single copies or in quantities at a discount for amateur radio instructors through the W5YI Group (800-669-9594).

The book is part of a series of amateur radio and commercial communication electronics books published by Master Publishing in Lincolnwood, Illinois [www.masterpublishing.com]. Master Publishing Editor Peter Trotter KB9SMG is the book editor. Gordon West, with his wife Suzy West N6GLF, were proud to take an enormous 511-question pool and rearrange it so that applicants are truly learning the material as opposed to simply memorizing questions to get through the test.

Real Helps for Morse Code (for Free!)

Even with the relaxed requirements for Morse Code proficiency and the increased interest in digital soundcard modes, many hams are drawn to the Brasspounders Society (and that is not to be taken as BS).

The reasons are many, but the main one is that it is still a part of ham radio, plus it is a dependable method for communicating under adverse conditions, and equal to just about any mode available, even in this advanced age of technology.

This month, I have two programs that may easily interest many of you who have an interest in CW. The first is a program developed by Ed AC3L that approaches learning the code in a rather unique way. He takes you from ground zero through a series of painless hoops, and the process makes sense right from the beginning.

Some of us, who feel secure in our code proficiency, tend to hesitate when we first see a program such as the International Morse Code Trainer (IMCT) for beginner's software. My opinion was that it wasted some time getting started. I was quickly proved wrong on this, and will explain how I learned the error of my ways.

I could see I was in need of an attitude adjustment, so I had to see this program through someone else's eyes. It was not necessary to look very far to find the right person to run a short experiment for me. Janet, the other half of this household, is a confirmed nonham who is absolutely convinced she could never master the Morse Code.

So I approached her in what I felt was one of her weak moments and she consented to give this software a short test run. That was an eye-opener. She came back in about a half hour explaining how interesting the introductory explanations about the code and its uses in ham radio were to her.

This information had not appeared that engaging to me, and I had almost pushed her right past those to "get down to the meat" of the program. That showed how little I understood about the teaching process that

Ed has utilized so well in this program. This was going well.

Then she explained further how there seemed to be a need for a change in the sequence when first learning the sounds of the characters. I had her show me what she meant and it even made sense to me. I sent off a message to Ed and he set about to make that little change. No problem. He even sent a shot of the new screen format which I added to my existing image. Hence, a little fuzz crept in.

It became more apparent how much real value there is in this piece of software as I looked through the many features. There is real user interaction at every level. I think most users who seriously wish to learn the Morse Code will find this to be an enthusiasm-building process. As you learn, passing from one phase to the next, you will feel good about yourself, and gain appreciation for the utility of this excellent mode of communication.

Installation

Here is where we, as spoiled Windows users, may find a bit of a surprise. IMCT may not as a rule install on your computer as easily and painlessly as programs such as DigiPan. At least, that was the case with me, but it turned my thinking around a bit as to how out-of-date my Win98se platform was at the time.

As I recall my experience in the beginning, it just refused to install after the download. Something was amiss. I went back to the Web site [http://www.qth.com/antenna/] and did a little reading. I also communicated with the author of the software. Obviously, I was behind the times and in need of enlightenment.

Ed explained where my problems were and directed me back to his Web site, and

in the end, via links provided at Ed's site, I downloaded three vital tools from Microsoft's library that were missing from my Win98se install. They were, I believe, developments that came along after the release of my version of Win98, so I am now as up-to-the-minute as it gets. Well, this is true counting the 30 or so other updates installed along the way.

With all this in place, and I should explain that Microsoft makes the installation of these items absolutely painless, the IMCT software installed properly and performs like a million. What I am saying is, if I could struggle through the process, just about anyone can, and it is worth the effort. Not only is the IMCT package a real winner, but one day you will find that these tools will be critical for some other applications.

One final note: This should become a standard tool for clubs, or anyone in the Elmer position to assist those wishing to learn the Morse Code. There have been a lot of methods appearing over the years, and this one is about as good as it gets. It might be good to add that the program is strictly for learning at minimal speed (no high-speed practice), but once this is under a person's belt, it is not much of an effort to pass off five words per minute.

Now to the rest of the CW story

I have mentioned enough times in days past that I am one of those folks who actually enjoys the use of CW. I don't know if that is a macho ham attitude or simply what some would term masochism.

So it follows that I have always held a certain disdain for software that imitated the CW-mode. However, I am softening. Some of you will recall a recent column on CwGet (February 2003). And I am not alone. There were quite a few responses and sincere

interest in that software which, I have to agree with many, is about as good as it gets for receiving and decoding Morse Code.

It just so happens that I ran across a real contender in a piece of software for Morse Code that I was totally unaware existed. It is ET_Morse written by Patrick F6CTE. It can be downloaded from the G3VFP Web site, which you can get to by clicking on line 30 of *The Chart* on my Web site.

This is a full -featured TX-RX program with just about all the bells and whistles I could imagine to receive and transmit CW. And the good part? It really works!

You will notice in the screenshot the near-perfect copy of machine-sent text. That is one real time test. You will find that CW decoding programs will all have difficulty with hand-sent CW (electronic keys included) because of certain variations. It seems impossible for the best of programmers to write a one-size-fits-all algorithm to decode Morse Code from every source.

However, I spent quite a bit of time tuning to different signals and some that seemed perfectly readable to my ear were totally indecipherable by the software. Then there were some which were obviously paddle-induced and the copy was so good that if the mistakes formed a character, it was printed on the screen.

I was monitoring a QSO between two obvious old hands, really good "fists," and the print was so perfect I had to listen closely to read between the lines that they were sending with paddles. I was, to say the least, impressed both by the hams' skill and the program's decoding ability.

I attempted to answer a few 100%-copy CQ calls and was not answered, so I began to wonder if I had something wrong in my settings. So I picked out a fairly wide space in between signals and called CQ and got an answer. Wouldn't you know, the returning signal was one that I had to copy by ear, while thinking about entering information in little boxes in an unfamiliar program.

At least I knew then that the software was transmitting on the same frequency as the receive frequency and the output was legible Morse Code. The lesson learned to pass on is to use caution when making contacts with any CW software. Be ready to copy the old-fashioned way when you get a reply. But it is fun to play.

Feature list

There is a very adequate Help File. As a matter of fact, there are two, one in English and one in French. Regular Windows-style layout and helpful.

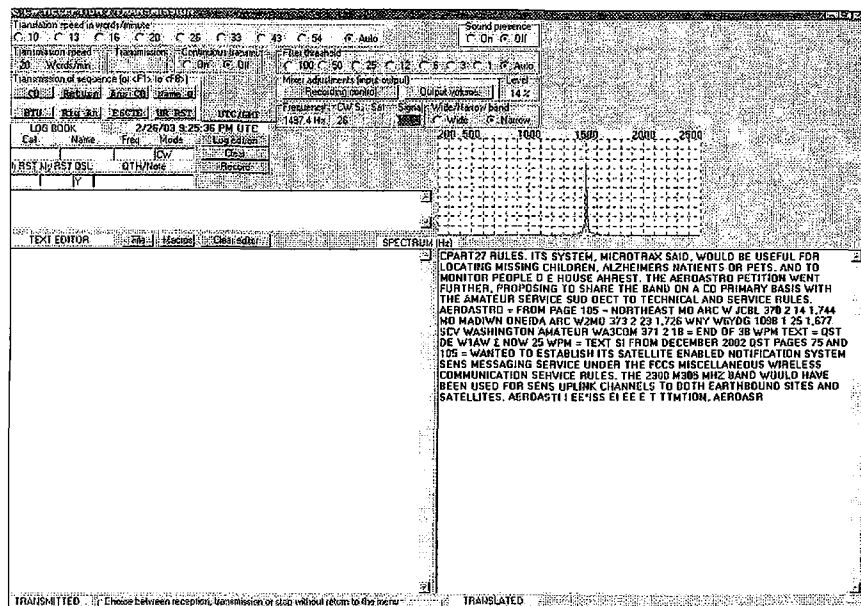


Fig. 1. ET_Morse screenshot. A first rate RX-TX CW program with just about every bell and whistle you can ask for. The text received panel is half-filled with copy from near-perfect computer generated CW transmission. I found hams sending with paddles that printed this well (see text). And I found some hams sending CW that was perfect copy "between the ears" but decoded poorly by the program. However, a lot of that happens with CW software. This one is way above average in every respect. It has macros and logging, and the grid above the receive pane is the spectral display with two choices for filtering. Clicking on a signal tunes ready for receive. A truly great work. Very usable and intuitive. PTT supported along with audio settings from the screen. And it is FREE!

Macro building is about as simple as it gets. You will find a pull-down menu in the Main screen where you can write and edit eight macros and put names on the macro buttons. There is a separate menu where you enter personal information such as your callsign and name, and the macros draw information from that file automatically. But the really nifty part I liked was that within the macro editor, there are automated buttons to insert strings such as MYCALL and HIS NAME. Click the button and it is typed in place.

One of the great features we have come to expect these days is log capability. You will find a built-in log that answers most every need for casual ragchewing, plus it goes a step further. You can not only edit and delete files in the log, but you can also export them in ADIF or text format. This means that you can transport your CW log file with a few mouse clicks from ET_Morse to your log program of choice.

Also, for some of us who complain about the wee-dinky text panel fonts, there are font size options available. I stumbled on this as I was clicking the pull-down menus on the opening screen. There is one labeled "Police." That is the one. Police? Well, I looked in my French-English dictionary and that

translates directly to "Font." See how we learn?

Really, just about everything you read on-screen within this program is in understandable English format or becomes obvious immediately. What I am saying is this is a very intuitive program. The "police" word so surprised me, I had to pass it on. That was the only mildly confusing item I recall.

Little differences

One other small item, I must bring to your attention. When you go to install the etmorse.zip file, you will unzip it, and there is no "Setup" file as we are used to using for installation. Unzip will result in 26 files that you need to put into a subdirectory you create and name. You may then either start the program by double-clicking the ET_MORSE.exe file or create a shortcut to do it for you. If you are impatient as most of us are, you will double-click the file the first few times. Anyway, the story is that the program is installed once you have the files in their own little directory, and it will run.

I noticed a small problem worth mention. And I have seen this with other software. I get so used to using the Function

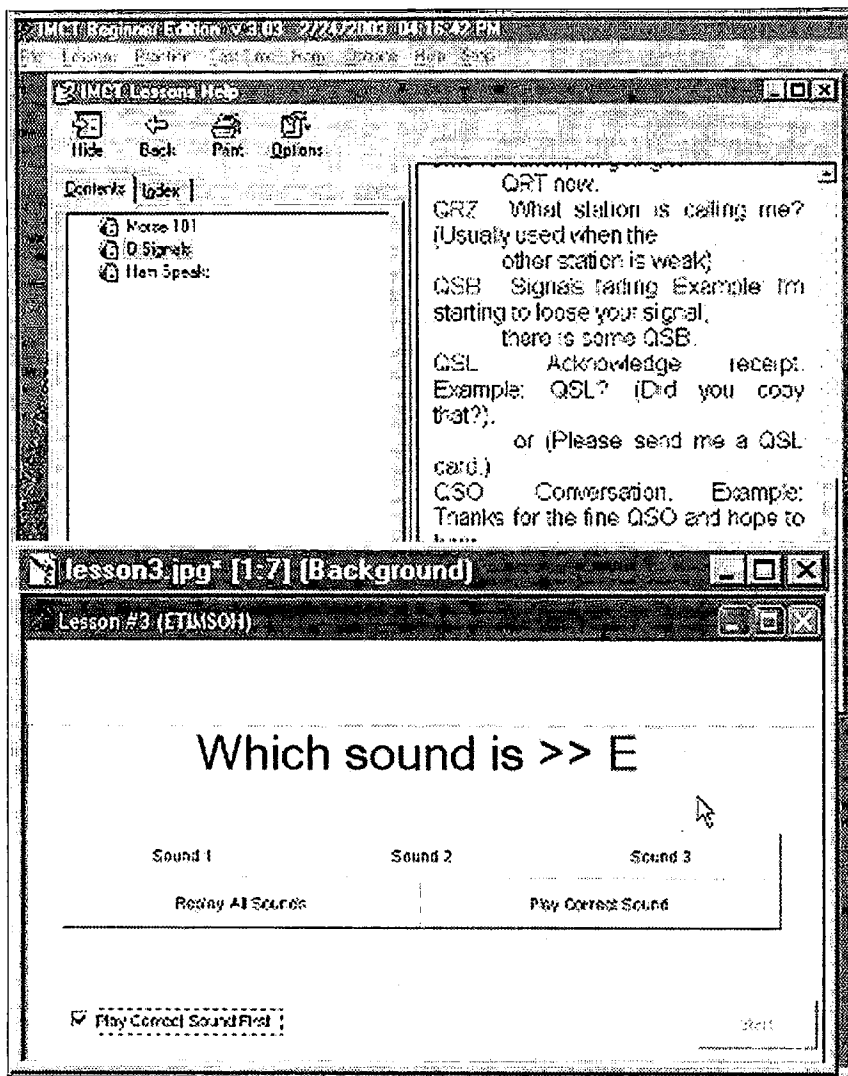


Fig. 2. IMCT screenshot. This gives just a glimpse of the depth within the Morse code training software. The shot is a composite that started just a bit clearer in the pane explaining Q-signals. This got redone when the program's author sent me a revised shot of the lower pane where he had added a requested revision (see text). The program teaches a group of character sounds at a time and interacts with the user to repeat as often as necessary or simply move on. The user advances at his own pace to a point where he is working with QSO-type messages. The student will find much information in addition to the file shown that will help him to understand how hams use the Morse code. A very effective training scheme, and it is **FREE!**

keys to activate macros that I take the process for granted. I found that this did not work dependably with ET_Morse. However, I have been advised in the past by some programmers that this is at least partially a Windows problem. So, not to condemn, but I advise you to use your mouse to activate macros in this software unless your particular system cooperates.

All in all, this was a very good experience as CW software goes. This is right up there with the best of them, and I definitely recommend a look-see.

Another program includes MFSK

MFSK has gotten a lot of attention lately, especially with the addition of the image capability included in the MixW2 release. For a time, it was becoming difficult to find a space to play. In the midst of all this, Sergei, the creator of TrueTTY (available from the DXSoft Web site), added the MFSK mode to TrueTTY.

I have only had a few minutes to take a short look at it, but it tunes and works very well. One noticeable plus is that the aggressive AFC in TrueTTY clamps right onto the

MFSK signal. Along with that, it seemed, sometimes, to jump off track while receiving. I think there is adjustment for AFC sensitivity, but I took an easy way and disabled AFC once copy was established, and it decoded just great. One thing to keep in mind is that the only MFSK software that will do images is MixW2. But there are now, by quick count, at least four software packages including this great mode. MFSK, in case you are not aware, has some real advantages in adverse conditions, such as multipath, high noise, and especially, pole flutter as compared to BPSK31. A little aside: I find a lot of hams are not aware that use of QPSK31 instead of BPSK31 levels the playing field in many of those instances mentioned above.

The image debacle

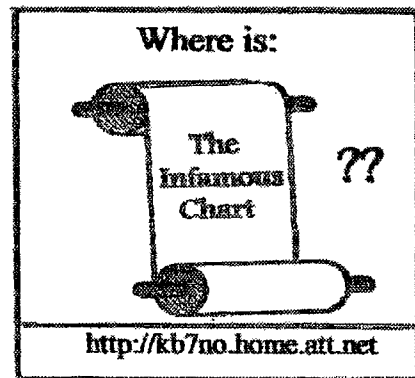
Suddenly, just as a lot of us were getting our acts together in the MFSK image fun, it was discovered that the country (US of A) where there is a huge interest in MFSK images has statutes that make these modes of transmission illegal where we were doing it. I won't go into the details, but after the word got out, the 14.080–14.083 image activity area went blank.

So now, before we can resume our fun and games, the FCC will have to make a ruling with either temporary or permanent changes to allow us to play. I hope it is in the form of a temporary waiver. Watching the wheels of government move on anything they consider "permanent" is worse, by far, than watching grass grow.

Perfect OS just about died

I guess I bragged a bit too much about the virtues of Win98se and, sure enough, it began to spit up hairballs recently. I think it was a product of way too many pieces of software and attendant data files with no

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Dim Sum, Dayton, and Doppler Calibration

"We did everything wrong!" That's what one new hidden transmitter hunter wrote in an e-mail that I received two days ago. He and his friends had learned some radio direction finding (RDF) lessons from the proverbial School of Hard Knocks as they tried to locate an intruder on the OSCAR two-meter subband.

They took longer than experienced transmitter hunters might have, but their efforts were successful and they can be proud of the result.

I had corresponded with Michael Weldon KB2UMJ of Stratford, New Jersey, seven years ago when he was constructing a Doppler RDF kit. Together, we solved some problems he was having with the display unit, but he never got around to building the antenna set. "The rest of life took over, two kids, a job and honey-do's," he wrote.

"This past week I had a rekindling of my RDF spirit," Michael continued. "A good friend, Patrick Guilfooy AB2HM, told me of a 'stuck mike' he found on 145.835 MHz. The signal was S9 at my home and S9 + 30 dB at his. The really strange part is that it sounded like a Chinese restaurant! The background sounds were that of a commercial take-out kitchen.

"I got out my 'RDF bible' and looked for the easiest thing I could whip up in a hurry. In about 15 minutes I had constructed a 2-meter loop out of a broomstick and 12-gauge Romex wire. I took some towels from the linen closet (my wife Colleen KB2UJW is still miffed at that), connected the loop to the receiver through a homemade switchable attenuator, and propped it up through the moonroof of my '99 Maxima. AB2HM and another friend, Rich Nicoletta KC2GIB met me, we took a bearing on the carrier, and went hunting.

"What should have taken ten minutes ended up at an hour and a half. The loop gave us a 50-50 chance on the direction of the transmitter and we kept picking the wrong one.² With 40 dB of attenuation, the meter was back to S9 + 30 dB as we were on top of small bridge over a creek. A Chinese take-out restaurant was directly

opposite the bridge on the other side of the creek.

"KC2GIB and I got out and looked around for any sign of an external antenna. Not finding anything and being hungry, we went inside and ordered some food while checking out the interior. Nothing seemed to point at a ham radio station or any other radio installation. We grabbed a menu that listed the street address and left with our food.

"The three of us decided that whatever these people were doing, it wasn't in our best interest to tell them to stop. The following day, KC2GIB contacted the local FCC staff and informed them of what we had found. They went out and tracked the signal themselves a day later. The FCC later contacted Rich to tell him that the transmitter was part of an illegally imported high-power cordless phone. The restaurant had been previously warned about its use, so this time it was confiscated."

Michael concluded his letter by exclaiming, "Now I really want to finish that Doppler!" He also asked a good question about antenna switcher construction. It fits right in with the "Homing In" Doppler series, so I'll include it in a future column.

Congratulations to Michael, Pat, and Rich for your resourcefulness and for being willing to take on this challenge. Your experience points out the advantages of building and thoroughly testing your RDF gear before an urgent need for it arises. Fortunately, it's easy and fun to do that in areas where there are regular competitive transmitter hunts. Mobile RDF contests, usually called foxhunts or T-hunts, continue to gain in popularity. The "Homing In" Web site has links to over 50 local T-hunt group sites around the country, plus E-mail addresses for group contacts in almost 20 more localities.

The most recent T-hunting hot spot to be added is Sacramento, California, where the North Hills Radio Club and the River City ARC have gotten together to put on monthly hunts just for beginners. Richard Hill NU6T has accepted the task of T-Hunt Coordinator and has gotten plenty of help from experienced hunters in the nearby Bay area, who are acting as Elmers.

Great Hamfest Hunts

If you don't have transmitter hunts in your hometown yet, or even if you do, you'll want to take part in the ones at hamfests and conventions you attend. They range from simple to very difficult and could be mobile, on foot, or both.

World-class mobile T-hunting is a tradition at the annual Orlando Hamfest, and it has become a tradition for "Homing In" to receive a report on it, with photos, from John Munsey KB3GK of Ormond Beach, Florida. He and Bill Thomas KE4HIX from Daytona Beach made up one of the seven teams that signed up for the Orlando hunt on February 9, 2003. They were destined for a very interesting afternoon, trying to find three foxes deployed by Pat Eckenrode AC4QM and Arthur Byrnes KA4WDK.

Pat and Arthur were winners in 2002. Their professed goal for this year was to stump the renowned KB3GK/KE4HIX team, and all the others in the process. They enlisted help from Howard Hershold KC4ZYC and the trio decided that each of them would plan and hide one difficult fox, with no coordination before the hunt. All transmitters were on different frequencies the hunters were required to find them in order. Transmissions were approximately one minute with two minutes off.

"Fox #1 was in an older community next

to a large lake," John wrote. "The streets do not run in any orderly pattern and many, if not most, go to dead ends. Even KC4ZYC got lost trying to find his spot on hunt day. Using both a mobile transceiver and an HT, Howard varied power from 50 watts to just a few milliwatts. Between transmissions, he changed antennas from beams to rubber duckies and varied his frequency as much as 12.5 kHz on either side of the announced spot. It all proved useless, as we bagged this one in about twenty minutes, no more than five minutes over driving time. One other team found this one, Jeff Mathews KG4DHZ and Fred Villers K8FV. Jim Korenz N8PXW got to a block away but could not navigate into the dead end street where it was located.

"KA4WDK hid fox #2 next to another lake," KB3GK continued. "This was a 5-watt rig into a dipole mounted twenty inches off the ground with the ends pointed in the direction that the hunters had to come from." Lakes and rivers sometimes act like RF conduits, leading RDF teams to make mistakes in determining from which bank the signal is coming. When John and Bill got to the lake, they decided to split, one going on each side. That was a good strategy, because Bill picked the right direction and spotted the fox in just a few minutes. No other team found this one.

AC4QM's fox #3 was a simplex repeater, listening on the hunt frequency and retransmitting the audio it heard every few seconds. Pat put it on the northeast side of a very large park, several hundred feet into a very thick wooded area. Armed with their Australian-made portable two-element

HB9CV-type antennas (**Photo A**), Bill and John beat the bushes and uncovered this one — the only team to do so. They also give credit to their new "Sniffer 4" receivers.³

Next stop for everyone was a local Steak and Ale for the traditional after-hunt party, where John and Bill were awarded the hunt prize, a new handie-talkie (**Photo B**). How will you split that, gents? Now it's time for them to start planning how they will hide this hamfest hunt in 2004.

What About Dayton?

"A mobile hunt at the Dayton Hamvention wouldn't be well attended because so many of the attendees don't have vehicles," says Dick Arnett WB4SUV. "They fly in and get around on the shuttle buses. We had a successful on-foot hunt at a nearby schoolground for a few years,⁴ but we don't have access to that property any more and there's no other suitable area close by."

Nevertheless, there will be plenty of opportunities to meet other T-hunters and learn about the sport at this year's Hamvention, May 16-18. Once again, WB4SUV will team up with Bob Frey WA6EZV to put on a two-hour Foxhunt Forum that will cover many aspects of RDF contesting, including equipment and techniques.

Bob and Dick will be the main forum speakers this year, because they have much to tell about the Third USA ARDF Championships. They are co-chairs of the organizing committee for this event, which takes place in nearby Cincinnati from July 30 through August 3. Terry Hudson KT9V will talk about his adventures in tracking radio-collared bobcats for

the Indiana Department of Natural Resources.⁵ Mobile transmitter hunting will also be covered.

"Usually we have had our Foxhunt Forum on Saturday beginning about 10 a.m., says Dick. "This year they have us scheduled for Friday morning, a much less desirable time. I have sent messages requesting a change to Saturday morning, and I'm still hopeful." Dick will keep me informed on progress, and I'll post updates on this Foxhunt Forum time in the "Homing In" Web site.

According to WB4SUV, "We had a full house last year, about 130 people, and they were there from the moment we started right up to the end. I sure hope we can repeat this year. But if folks can't get to the forum, they can stop by the OH-KY-IN Radio Club booth at the flea market and we'll give them the handouts and information about upcoming events."

Calibrating Your Doppler

This year marks the 200th anniversary of the birth of Austrian physicist Christian Doppler. "Homing In" is celebrating with a multipart series on Doppler RDF sets, which utilize Christian's discovery that the perceived frequencies of waves undergo changes when source and receiver are in relative motion. There's just enough column space left this month for a few paragraphs on calibration of Doppler sets.

In the first two installments, you learned how the simulated movement of a vertical or dipole antenna in a circular track at hundreds of revolutions per second induces a narrowband FM tone into the received



Photo A. Ready to track down any and all two-meter fox transmitters are Bill Thomas KE4HIX (left) and John Munsey KB3GK. (Photo by Anne Marie Elais)

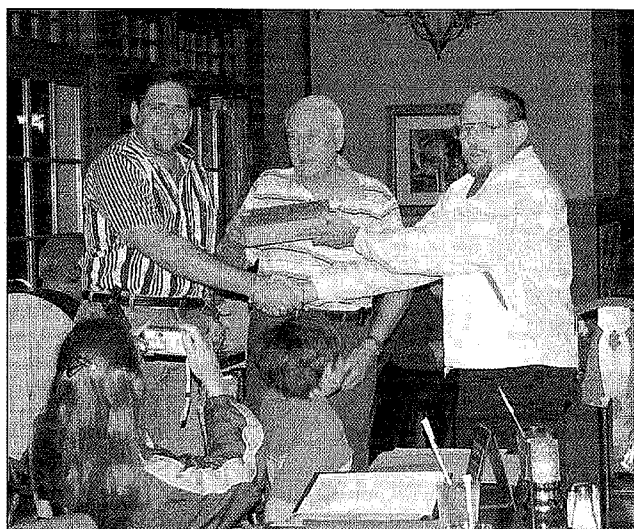


Photo B. KE4HIX and KB3GK receive their Orlando Hamfest T-hunt prize from David Flagg N4BGH of the Orlando Amateur Radio Club. (Photo by Anne Marie Elais)

audio. The phase of this tone is a function of the azimuth of the incoming signal. A Doppler RDF set has a circuit to detect the phase of this sine wave, usually by determining the timing of its zero-crossings. A calibration function in hardware or software establishes which zero-crossing times correspond to straight ahead, left, right, behind, and so forth.

Before you take your new Doppler set out on a hidden transmitter hunt, you'll need to set the calibration. You should also verify that display indications are correct for signals from all directions, proving that the antenna control lines are wired correctly. Re-calibration should be done each time you change receivers, vehicles, or ham bands, but it is not required when you QSY within a band.

The intuitive way to check calibration would be to take a quick walk around the vehicle with a transmitting hand-held, watching the LED display to see if it follows along. But this is not a reliable method. A perfectly good antenna system is likely to give bad results, for two reasons. First, the display electronics and switcher diode currents may be upset by the intense RF field from the HT.

Second, a Doppler array is designed to work with a "planar" wavefront in the "far field," to use some terms that \$100-an-hour antenna engineers like to toss around. Put more simply, the wavefront coming off your HT's "ducky" is a circle that expands outward. It's just like the ring of ripples you get when you toss a rock into a still pond. When the transmitter is very close to the receiver (in the "near field"), the part of the wavefront that strikes the receiving antenna has a lot of curvature to it. When it is many wavelengths away ("far field"), the wave-front circle has become so big that the segment reaching the receiver has very little curvature and appears to be planar.

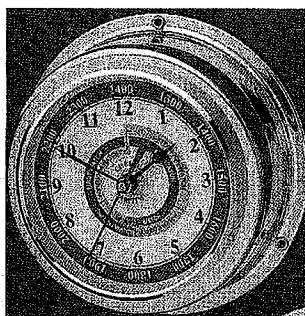
Another factor to consider is that Doppler accuracy can be degraded by proximity to anything that disrupts the planar characteristic of the incoming wavefront. Other communications antennas on your car may "pull" the Doppler indication in their direction. The effect is most detrimental when whips are in front of the Doppler array, or when you have a rotatable beam mounted on the car.

For the most accurate calibration, you need a steady signal that's in a known direction, as you travel on a street to average the local multipath effects. Some hams have a friend drive in front of them at the same speed, a couple of blocks ahead. That works, but it's not convenient for frequent or prolonged testing.

The "standard course" that I use here in Fullerton is a city street that runs radially from a two-meter repeater at an aerospace facility. While the repeater is active, I tune to the output and drive directly toward it on a half-mile section of this street that is about 2 miles away. To verify indication of other directions, I drive circles in an open parking lot next to this street.

The repeater is mostly line-of-sight from this test course, but there are urban features to provide some signal bounces (multipath). I can readily compare multipath performance between antenna systems and display models. I can also make checks before T-hunts to make sure that the calibration is still good and that the antenna system is working properly. One day I observed that the display did not track the repeater as usual. It just bounced around in one quadrant of the display, no matter which way the car was traveling. I checked the DC whip voltages and noticed that one was different from the others. Sure enough, a resistor lead in one antenna base was poorly soldered (oops!) and had lost contact, keeping the two PIN diodes in series with that whip from conducting.

If the Doppler under test has serial bearing output that can be



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Continued on page 61

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the August issue, we should receive it by May 31. Provide a clear, concise summary of the essential details about your Calendar Event.

MAY 3

CADILLAC, MI The Wexaukee ARC will hold their Annual Amateur Radio and Computer Swap Meet on Saturday, May 3rd, from 8 a.m. to 1 p.m. at the Cadillac Jr. High School in Cadillac MI. VE exams at 10:30 a.m. You must pre-register for testing starting at 8:30 a.m. Limit 50. Free parking. Admission is \$5. 8 ft. tables are \$8 each. For tables, call Brian Polk KC8TXT at 231-743-6860, or E-mail [bandb@netonecom.net]. For general info please write to Wexaukee ARC, P.O. Box 163, Cadillac MI 49601. Talk-in on 146.98 rpt.

MAY 3, 4

ABILENE, TX The Key City ARC will sponsor the ARRL West Texas Section Convention and its 18th annual Hamfest at the Abilene Civic Center, 1100 N 6th St., from 8 a.m. to 5 p.m. Saturday, and from 9 a.m. to 2 p.m. Sunday. Free parking. VE exams. Wheelchair access. Limited RV parking for a nominal fee. Tables \$7 each. Pre-registration \$7, must be received by April 29th; \$8 at the door. Talk-in on 146.160/.760. For reservations and info, contact Peg Richard KA4UPA, 1442 Lakeside Dr., Abilene TX 79602; phone 915-672-8889. E-mail to [ka4upa@arrl.net].

MAY 10

FREDERICKSBURG, PA The Appalachian Amateur Radio Group Inc. will hold their AARG Hamfest at Fredericksburg Fireman's Park, located on Route 343, 1.3 miles south of Route 22, north of Lebanon. Talk-in on the AA3RG rpt. 146.640(-600). Admission is \$5 for sellers and buyers. Anyone under the age of 16 will be admitted free. Breakfast and lunch will be available. Setup for sellers is at 6 a.m. Special arrangements to set up Friday evening can be arranged in advance by contacting AARG. Anyone arriving between 10 p.m. Friday and 6 a.m. Saturday will not be allowed in the tailgate/pavilion area. Overnight security will be provided. Buyers admitted at 8 a.m. on Saturday. 10' x 10' tailgate space \$5, plus admission fee. 8' tables in the pavilion are \$15 each, plus admission. Electric available. Additional info is available on the AARG Web site at [www.aa3rg.org]. E-mail to [info@aa3rg.org], or call Dick Wise K3MIK at 717-534-2945, or Neil Shatto N3JQM at 717-469-7357. No electronic equipment is allowed to be left as trash — please take these items with you.

RENO, NV The Reno Area Metro Simplex ARC will sponsor the Reno Spring Ham Swap 2003 at the Salvation Army Headquarters, 1931 Sutro St., Reno, 7 a.m. to 1 p.m. Talk-in at 147.060(+123) on the RAMS rpt. system. Ham swappers bring your own table. Large outdoor parking lot available. A raffle, coffee, doughnuts, VE session and other activities are being planned. A map can be found at [http://www.cvrc.net/images/SACenterMap.gif]. Contact Gary Grant K7VY by E-mail at [k7vy@netzero.net]. For info about the VE exams, E-mail Don Freeman W7FD at [donald_freeman@sbcglobal.net], or call 775-851-1176. Exams start at 11 a.m.

MAY 18

CAMBRIDGE, MA The FLEA at MIT, sponsored by the MIT Radio Society and the Harvard Wireless Club, will be held in the Albany Street Garage at Albany and Main Streets in Cambridge, from 9 a.m. to 2 p.m. Sellers setup at 7 a.m. Covered space is available for all sellers in the event of rain. Talk-in on 145.23(-) PL 88.5 and 449.725/444.725 PL 114.8. For more details contact Nick KA1MQX at 617-253-3776, 9 to 5 M-F, or visit the Web site at [http://web.mit.edu/w1mx/www/swapfest.html]. This event is also being held on the following dates: June 15th, July 20th, August 17th, Sept. 21st and Oct. 19th.

MAY 24

WINTERVILLE, NC The East Carolina Antique Radio Club Annual Swapfest will be held 8 a.m. to 3 p.m. at Kiwanis Club, 177 Forelines Rd., Winterville NC 28590. Free admission. Inside tables \$15, outside tailgate \$10, bring your own table/chairs. Setup will begin at 7 a.m. Drinks and hot dogs will be available. Contact Herman Schnur K4CTG, 3205 Brick Kiln Rd., Greenville NC 27858; phone 252-752-2264. E-mail [hschnur@cox.net]. Or contact William Engstrom, 218 Bent Creek Dr., Greenville NC 27834; phone 252-355-8732. E-mail [Wengstrom@vol.com].

GREENVILLE, NC Annual Swapfest 8:00 a.m. to 3:00 p.m. Sponsor: ECARC, Kiwanis Club, 177 Forelines Rod, Winterville, NC 28590. Admission: free. Inside tables: \$15.00; outside tailgate: \$10.00. Contact: Herman Schnur K4CTG, 3205 Brick Kiln Road, Greenville, NC 27858; phone: 252-752-2264; E-mail: [hschnur@cox.net].

MAY 25

WEST FRIENDSHIP MD The MFMA Hamfest will be held on May 25 from 8 a.m. to 2:20 p.m. Sponsor: Maryland FM Association. Location: Howard Co. Fairgrounds, I-70 to Rte. 32, south to Rte. 144, turn right, go west on Rte. 144 approx. one mile to fairgrounds. TI: 146.76, 224.76, 444.00. Donation: \$5. Tables in adv., \$25; door, \$30; tailgate \$5 (per space). Reservations: MFMA, P.O. Box 351, Hanover MD 21076. Phone: 301-641-5313 from 6 p.m. to 10 p.m.

MAY 31

WASHINGTON TOWNSHIP, NJ The Bergen ARA will sponsor its Annual Spring Hamfest on Saturday, May 31st, at the Westwood Regional Jr./Sr. High School, 701 Ridgewood Rd., Washington Township NJ. The location is approximately 15 minutes from the GW Bridge and 5 minutes from Paramus NJ. Talk-in on 146.19/.79. Vendors setup at 6 a.m. General admission 8 a.m. to 2 p.m. VE exams 8 a.m. to 10 a.m. only. DXCC card checking. Indoor and outdoor spaces are available. Lots of parking for tailgating. Admission is a \$5 donation (non-ham family members free). Vendors \$15 per space. Rest room facilities and refreshments available. For more info check the BARA Web site at [www.bara.org], or contact Jim Joyce K2ZO at [K2ZO@arrl.net], or call 201-664-6725.

SPRINGFIELD, IL The Sangamon Valley Radio Club's annual Hamfest will be held May 31st at the Illinois State Fairgrounds Cooperative Extension Bldg. in Springfield IL. Directions: Interstate I-55 to exit 100B, go west on Sangamon Ave. 3 miles to the fairgrounds. Watch for signs. Enter Gate 11 at 8th St., off Sangamon Ave. GPS coordinates: Lat N 39 50.16364 Lon W 89 38.73376. Talk-in on 146.685(-). The flea market pavilion opens at 6 a.m., commercial exhibits open at 8 a.m. Tickets \$5 each. No additional charge for flea market space. Bring your own tables. Commercial dealers, contact us for information about Friday indoor setup. VE exams, no pre-registration necessary. Testing begins at 9 a.m., last registration is at 10 a.m. Those wishing to take exams need \$12 testing fee, photocopy of license (if you are upgrading), Social Security number, two IDs, one of which must be a photo ID, and any applicable CSCE.

Contact Ed Gaffney, 13997 Frazee Rd., Box 14A, Divernon IL 62530. Call 217-628-3697, or E-mail [egaffney@family-net.net].

JUNE 7

BANGOR, ME Bangor Hamfest at Hermon High School, Hermon, Me. Time: 8 a.m. to 1 p.m. Admission, \$5.00. Tailgaters, \$5.00. Directions: Interstate 95 to Exit 44 North to Rte #2, left on Rte #2 West for 1-1/2 miles to High School. From Newport, East on Rte #2 to Hermon Corner, then 1/2 mile east on Rte #2 to High School. Talk-in Freq. 146.34/94. Simplex 146.52. Grand Prize drawing At NOON. Must be present to win. Programs: ATV, APRS, ARES/RACES DEMO, TRAFFIC HANDLING, PSK 31, VINTAGE RADIO, ECHO LINK, FOX HUNT, GEOCACHING. Club Web site: [www.n1me.com]. Contact Person: Roger W. Dole, 207-848-3846; E-mail: [rdole@hermon.net].

WINSTON-SALEM, NC Set up Fri. night or 6 a.m. Sat.; gates open 6 a.m. to 1 p.m. Sponsor: Forsyth Amateur Radio Club. Dixie Classic Fairgrounds; I-40 to US52 to Akron Dr., follow signs to fairgrounds, enter Gate 5 off Deacon Blvd. Fleamarket, tailgating, VE Session. Camping hookups available for Friday night. Talk-In: 146.64 (145.47 B/U). Admission: \$5.00; tables: \$15.00. *Raymond Taber KG4NTC*, 336-786-8241 or 336-723-7388. E-mail for info: [kg4ntc@yahoo.com]. General info: [http://www.w4nc.com].

JUNE 14

MIDLAND, MI The Midland Amateur Radio Club (M.A.R.C.) will sponsor its 26th annual Hamfest on Saturday June 14, 2003, from 8:00 a.m. until 1:00 p.m. at the Midland County Fairgrounds. Admission is \$4.00 per person, advanced table reservations are available for \$6.00 per 8 foot section, and trunk sale space for \$5.00 per space plus admission. FCC exams will be administered, food will be available. (Friday night camping is available on the fairgrounds.) Location: *Gerstacker Fair Center on the Midland County Fairgrounds*. Use Entrance off Airport Road. For further information and table reservations: *M.A.R.C. Hamfest*, P.O. Box 1049, Midland MI 48641-1049, or *Bill AB8JF*, 989-835-5562; E-mail: [ab8jf@arrl.net]. Also: *Lee KC8ITI*, 989-652-6213.

MONUMENT, CO Pikes Peak Amateur Radio Association Swapfest will be held on June 14, 2003, at the Lewis-Palmer High School, 1300 Higby Road, Monument, Colorado (just east of I-25 between exits 158 and 161). Prizes include Yaesu FT-817, Yaesu 8900R, Yaesu VX-1R. Forums, VE session, junk auction. Admission is \$5.00. Contact *Dennis N0ABC*, n0abc@arrl.net. Additional information: *Kate Muniz, kcegi@aol.com*. Doors open 8:00 a.m. (0600 for sellers).

JUNE 21

PISCATAWAY, NJ W2QW, the Raritan Valley Radio Club, will hold "Hamfest 2003" at Piscataway NJ High School (NEW LOCATION), near intersection of Old New Brunswick and Behmer Roads. Sellers 6:00 a.m., Buyers 7:00 a.m. - 2:00 p.m. Admission: Buyers \$5.00, Sellers \$5.00 (\$5.00 each additional space). Talk-in 146.625(r), 447.250(r), tone 141.3, 146.520(s). Contact person: *Marty Ficke KD2QK@aol.com*, 725-968-6911, or *Fred Werner KB2HZO*, 732-968-7789 before 8 p.m. *Raritan Valley Radio Club W2QW*. Web site: [www.w2qw.org].

JULY 26

CINCINNATI, OH West Side - Saturday, July 26, 2002, Flea market 6 a.m. - 1 p.m. Air-conditioned inside vendor area 8 a.m. - 1 p.m. Sponsor: OH KY IN Amateur Radio Society. Location: Diamond Oaks Career Development Campus, 6375 Harrison Avenue, Cincinnati, OH (handicapped accessible). This large facility is located just east of I-275 and I-74. Take I-74 to the Rybolt Road/Harrison Avenue Exit (Exit #11). Go east on Harrison Avenue. Diamond Oaks is located on the right (south side) of Harrison Avenue, less than one mile from the I-74 exit. Special seminars, transmitter hunts, indoor vendors, large outdoor flea market, door prizes, VE exams (8 a.m., walk-ins accepted), refreshments, free parking, handicapped parking available. ARRL-approved! Talk-in: 146.670(-) repeater. Admission: Adv. \$5, gate \$6., age 12 and under free. Indoor vendor tables (6 ft. with free electricity) \$10 ea. Outdoor flea market, \$1 per space. Contact *Lynn Ernst WD8JAW*, 10650 Aspen Place, Union KY 41091-7665; 859-657-6161, E-mail [wd8jaw@arrl.net]. Web: [www.ohkyin.org].

AUG 2

ALFARATA, PA Juniata Valley ARC Hamfest, 6:30 a.m. General admission, 8:00 a.m. Morning and noon food items available. Admission \$2.00 donation, XYL and children free. Tailgating \$5.00 donation, includes admission. Indoor tables, \$10.00 donation per table. Space is limited. Vendors responsible to collect PA sales tax. Electricity, \$2.00 additional. Please bring your own power cords. Directions: The Decatur Fire Co. is located along US Route 522 North, 8 miles east of Lewistown, PA in the town of Alfata, PA. Look for signs. Talk-in on 146.910 MHz. For more info, contact *JVARC*, PO Box 73 Yeagertown PA 17099, or contact *Cliff Bell WB3IVX*, 717-248-2616.

SEP 25-28

SEATTLE WA Microwave Update 2003 organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25-28, 2003. Registrations for the joint conference will be accepted beginning

April 1st. Cost of the registration will be \$40 prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be \$50. Registration forms can be downloaded at [www.microwaveupdate.org] or send an SASE to *John Price N7MWV*, 12026 81st Ave. NE, Kirkland WA 98034, and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to *Microwave Update 2003*. Joint conference sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are \$69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at 425-337-2900. Be sure to mention "Microwave Update" to get this rate. Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to *Jim Christiansen K7ND*, via E-mail at [k7nd@att.net]. MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to *NU7Z* [nu7z@aol.com]. For presentations at the Pacific Northwest VHF Conference sessions, contact *N7CFO* at [n7cfo@ix.netcom.com]. LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice.

SPECIAL EVENTS, ETC.

MAY 2-4

MARTHA'S VINEYARD, MA The Fall River ARC will be having its 10th Annual Martha's Vineyard Gay Head Lighthouse DXpedition (IOTA NA-046) starting 14:00 UTC May 2nd and ending 17:00 UTC May 4th. Listen for W1ACT on 14.260, 21.260, 28.460 and 146.550. SASE for a QSL card via *Roland Daignault N1JOY*, 19 Davis Rd., Westport MA 02790. He can be reached by E-mail at [n1joy@arrl.net].

Continued on page 58

CALENDAR EVENTS

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MAY 10, 11

KANSAS The Kurt N. Sterba Strange Antenna Challenge will start Saturday, May 10th at 10 a.m. Central (15:00 UTC) and end Sunday, May 11th at 7 p.m. Central (01:00 UTC). Main freq: 28.500± 20 kHz as per the QST listing. For more info check the Web at [<http://www.leafwerks.net/n0ew/StrangeAntennas/k0s.html>]. What are strange antennas? Metal folding chairs, ladders, painting easels ... anything except wires or pipes.

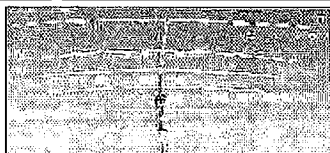
MAY 24-26

FORT WAYNE IN Memorial Day Special Event. HF bands. We will try to list the frequencies with Midcars 7258. The Veterans National Memorial Shrine (VNMS) of Fort Wayne, 21220 O'Day Road, Fort Wayne IN 46818. Sponsored by the Fort Wayne Radio Club and other volunteer amateurs. For info, contact Robert Hilton N9SJV, 5809 Heatherview, Ft. Wayne IN 46818. 73

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DESIGNS
BY K6MYC



How to Avoid a Disaster Disaster

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swap. What I've seen most often for maintenance is that people will hang on to a part (like a transmit module or the controller) after it's been exchanged for an upgrade. Don't get rid of the old parts!

The lesson here is to stay focused on what it is that you're actually trying to accomplish. When it comes right down to it, the people you're trying to help in a disaster area would probably think more favorably of extra bandages than counting knobs on your ultra-deluxe chrome-plated gadgets. 73

Ready, Set ... Don't Go?

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arise, I decided to attend an orientation course. I attended to satisfy my curiosity and to prepare myself for volunteering at some future date should it become necessary. I would be just as happy to remain sitting in my operator's chair, working DX and building QRP rigs, and not ever having to be called into service as a volunteer. But that would be in the "perfect world."

The orientation course I attended was hosted by the American Red Cross of Greater New York, Sullivan County Chapter, which is located about 90 miles north of New York City. Arrangements for attending had been made prior to the scheduled date to ensure that all those who wished to volunteer were aware of the location, date, and time. About three hours of your time will be required to complete the course. During that time you will be asked to complete paperwork, watch videos about Red Cross history and goals, and participate in programs and training available to all volunteers. Refreshments were provided during the orientation, and every effort was afforded to have you feel comfortable and needed.

It's a non-pressure meeting. By that I mean that you don't have to volunteer if you really don't want to. Of course, the volunteers presenting the course would like for you to become their newest volunteer, but the commitment is *entirely up to you*.

They will explain their role in the volunteer scheme of things, the courses offered to volunteers covering a variety of subjects, and a host of other subjects. It's a good thing they provided me with a package of literature describing all of that which is offered — it was too much to be remembered!

For those who decide to begin their volunteer activity, a temporary non-photo ID form is completed and shipped off to other volunteers who process your paperwork. Receipt of the ID is dependent upon the volunteers' workload. Mine was in the mail in about a month from attending the seminar. This temporary ID will be replaced with a photo ID once the initial trial period is complete.

Training

Training is provided on a request basis. That is, you "request" that you attend training from a schedule of subjects. Your Office of Affiliation will then help your request be accomplished. Classes are scheduled to provide the most benefit to all members and to meet the needs of the organization.

There you have it! I'm not an aficionado of any one volunteer organization. I find that they all provide an invaluable service in times of need, and each has its share of benefits and quirks. I attended the Red Cross orientation course because it is the most visible organization of this nature in my area.

The American Red Cross can be contacted by telephone; their number is listed in the white pages of most telephone directories. The number for the Greater New York chapter is 212-787-1000. I'm sure they can provide you with other numbers applicable to your location.

You never know when Mother Nature will "do it to you" in your area, or those other folks will again try to impress us with their beliefs. Give some thought to becoming a registered volunteer. Explore those agencies in your area that you often pass on your way to work, but haven't yet visited to find out just what they're all about.

You may be glad you did! 73

Ham vs. Power Outage

continued from page 33

I've read that even after a good cleaning there is still the chance of having some contaminants in the jugs.)

I didn't try powering our refrigerator with the inverter. It was cold enough outside that we could store all the food in baskets in the garage.

The car engine has to be started and run at idle for approximately 20 minutes every 5 to 6 hours to recharge the battery. This is something you must do. The inverter instructions say not to start a car engine with the inverter running. I suspect that a voltage spike from the starter motor could do permanent damage to the electronics in the inverter. To be safe, I removed the connector from the battery so the inverter was disconnected when I started the car engine. I don't know if simply shutting off the inverter at its switch would keep the spikes out of the inverter, but I didn't want to find out during the ice storm

Memories of the ice storm

Memories of all that happens during an event like this tend to fade. Even so, I'll never forget seeing the flashes of light reflected from the clouds. It's hard to explain the feeling of isolation you get when you're in the garage running the car engine to recharge the battery at 3 in the morning. But, I saw our neighbor refueling his generator at the same time one morning. The feeling of isolation was especially bad when I could see the next neighborhood over all lit up — they had power and we didn't — and they're only a block away. But, we did have heat!

If you don't feel comfortable working with the power wiring going to your furnace you should call an electrician to make the needed modifications. The rest you can do yourself.

If you build this system, please write me and let me know how it works for you. I had fun building it and a real sense of accomplishment when I had to use it in a real emergency. Many thanks to my wife Yvonne for proofreading this article and noticing the source of clean water from our roof. 73

The History of Ham Radio

continued from page 40

debates before reaching compromises, recognized the need for extension of broadcast into the higher frequencies, but did not want to encroach upon the major bands used by the amateurs. The extensive progress continuously made by amateur and experimental "wireless" was clearly exemplified in the assignments made to the frequency bands for amateur use. 73

HAMSATS

continued from page 46

Journal always has the latest updates on current and future projects, in addition to construction articles and details on new hamsats from around the world. AMSAT can be contacted by mail at AMSAT-NA, 850 Sligo Avenue, Suite 600, Silver Spring MD 20910-4703. The phone number for information is 301-589-6062, and for orders or to join, 888-322-6728. 73

ON THE GO

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very beneficial. However, with so many TMD-700A transceivers being used as mobile rigs, you may want to power it from the car's electrical system. In that case, you may want to be able to turn the unit on and leave it on as long as the car and radio are operating,

There's no particular order for installing the components, but as always, orientation of semiconductors and electrolytic capacitors is critical. When you are finished, take a few minutes to double check the installed components and inspect the circuit board for solder bridges or cold solder joints. If you decide to use a case, John recommends the Pac-Tec HP9VB.

In order to operate the unit, it must be connected to the radio, keyboard and power supply. There are four jacks on one end of the circuit board. There is a coaxial connector that can be used to provide 12 volts to the circuit. The next connector is used to connect a PS/2 keyboard. If you have a number of keyboards in your junk box, this is the keyboard with the smaller connector. While you can use an adapter, most adapters are built in such a way as to exert enough leverage on the board to damage it over time. I strongly recommend using the correct

keyboard. These can be found at office supply stores for less than \$20, and if you're lucky, sometimes the chains will have them for about \$10 with a \$10 rebate.

The microphone from the Kenwood TMD-700A is unplugged from the radio and plugged into one of the RJ-45 jacks on the interface. A "straight through" jumper is then plugged between the radio and the interface board. Don't worry which item is plugged into which connector on the interface board. They are wired in parallel, so it doesn't matter.

There are a few commands that must be given to the Kenwood radio before you're ready to go. These set several of the function keys on the keyboard to allow the most features to be handled from the keyboard. If you switch on the interface now, the red LED should light and the keyboard will probably do a quick self-test. With most keyboards, this is evident by the three green LEDs above the numeric keypad flashing three times. You are now ready to use the keyboard.

The main purpose of this interface is to allow you to send text messages easily. If you press the F2 button it will immediately take you to the "Send Message" screen. Enter the callsign of the station you wish to contact and press ENTER. Type your message and again press ENTER. You're done and your message is sent. The F3 button will take you to the recently-heard-stations list. Since the up and down arrows on the keyboard function like the up and down buttons on the microphone, scrolling through the list is easy.

The D700 interface can't quite do everything. If you are a world class touch typist, it won't keep up with you. Remember the fact that to get an "@" sign you would have had to press 18 keystrokes? You may only press one key, but the interface translates this into the required 18, so there may be a very slight delay. There are a few errors that may occur when the radio is in a different mode where the command you are typing means something else. In most cases, you can get out of difficulty by either pressing the ENTER key, or pressing the ESCAPE key twice.

This product is intended for APRS use, and APRS is a very specialized method of digital communications. Most of the time the information sent by APRS is position sensitive as opposed to message sensitive. However, there are times when sending a message is helpful.

Most of the time the messages sent by

Continued on page 61

Fairly Fair

The sun is expected to be mildly unsettled this month, so my overall forecast is for Fair (F) conditions to prevail.

The period from the 4th through 11th will be relatively uneventful and should allow decent propagation despite numerous minor flares. The end of May and early June should be noticeably free from solar disturbances, however, and could provide some excellent opportunities, but by then we will have entered the so-called "summer doldrums," so openings on the lower bands will be rather limited.

The two-week stretch from the 13th to the 25th will probably be most frustrating for DXers because of coronal hole effects and an overall increase in the magnitude of solar flares. I expect the 22nd, 23rd, or 24th to yield one or more strong disturbances and possibly a major proton event, but this is the only period where my charts indicate that such an occurrence is likely.

While late spring in the middle latitudes marks the beginning of the "summer doldrums" (bringing lower MUFs, higher noise levels, and daytime over-ionization), it is also the season where "sporadic-E" propagation can turn otherwise dead or declining bands around.

During daylight hours, electron density (a measure of the ionization potential) can reach very high levels, creating localized patches or "clouds" in the E region of the ionosphere. Once formed, these electron clouds generally drift from east to west and have been shown to move at roughly 110 mph. They sometimes persist well into the night even though direct ionization from the sun has ceased.

Sporadic-E can significantly affect radio wave propagation, and typically produces single-skip distances of between 500 and 1,500 miles. Double-hop and even triple-hop propagation has been noted when sporadic-E is widespread. These unpredictable E-clouds can

May 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
				1 F	2 F-P	3 F
4 F	5 F-G	6 F-G	7 F	8 F-G	9 F-G	10 F-G
11 F-G	12 F	13 F-P	14 F	15 F	16 F-P	17 F-P
18 F	19 F-G	20 F	21 F-P	22 P	23 P	24 P
25 F-P	26 F-P	27 F	28 F	29 G	30 G	31 G

EASTERN UNITED STATES TO:												
GMT	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15-20	(15-40)	20 (40)	20 (40)	(20)	(20)	(15) 20	15 (20)	15 (20)	15 (20)	10-20	(12) 20
South America	15-20	(15)	(15) 20	(20-30)	x	(20)	(15-20)	(15)	(15)	(10-15)	10 (20)	(10) 20
Western Europe	20 (40)	20-40	(20-40)	(20-40)	20	(20)	(15-17)	(15)	x	(15-20)	(15) 20	(17) 20
Southern Africa	(40)	(40)	20	20	x	x	x	(12) 15	(15)	(20)	(20)	x
Eastern Europe	20 (30)	20 (40)	(20-30)	x	x	x	x	x	x	(15-20)	(12) 20	(17) 20
Middle East	20 (40)	20 (40)	(20-30)	x	x	(20)	x	x	(15)	(15-20)	15-20	(15) 20
India/Pakistan	(15-20)	(20)	x	x	(20)	x	x	x	x	x	x	(15)
Far East/Japan	x	x	x	x	x	(20)	(20)	x	x	x	x	(15)
Southeast Asia	(15-20)	x	(20)	x	x	(20)	x	x	x	x	x	(15-20)
Australia	15	(15)	15 (20)	20 (30)	(20-40)	(20)	(17) 20	(20)	x	x	x	(15)
Alaska	(15)	(20)	(20)	(20)	(20)	(20)	(20)	x	x	x	(15)	(15)
Hawaii	15 (20)	(15) 20	20 (30)	20 (30)	20 (30)	(20-30)	(20)	x	x	x	(15)	(10-15)
Western USA	(12) 20	(12) 40	(20) 40	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20
CENTRAL UNITED STATES TO:												
Central America	15-20	(15) 20	20 (40)	20 (40)	(20)	20 (40)	20	(15) 20	15 (20)	(10-20)	10 (20)	(10) 20
South America	10-20	(12) 20	(15-40)	(20-40)	x	(20)	(20)	(15)	x	(10-12)	(10-15)	10 (20)
Western Europe	(17) 20	20 (30)	20 (40)	(40)	x	(20)	(20)	x	x	x	x	(15) 20
Southern Africa	x	x	(30-40)	(20)	x	x	x	(15)	(15)	(20)	(20)	x
Eastern Europe	20	20 (40)	(20-30)	(20)	x	(20)	(20)	x	x	(15)	(15-20)	(20)
Middle East	(17) 20	20 (40)	(20-30)	x	x	x	(20)	x	x	x	(15)	(15-20)
India/Pakistan	(15-20)	(15-20)	(20)	(20)	(20)	(20)	(20)	x	x	x	x	x
Far East/Japan	(15)	(15)	(15)	x	(20)	(20-40)	20 (30)	(17) 20	(20)	x	x	x
Southeast Asia	(15)	(15)	(20)	(20)	(20)	(20)	(20)	(20)	x	x	x	x
Australia	(15)	15	(15-20)	20 (30)	20 (40)	(20-40)	20 (40)	20	x	x	(15)	x
Alaska	(15-17)	15 (17)	(15) 17	(20)	(20-30)	(20-40)	20 (30)	(20)	x	x	(15)	x
Hawaii	(10-20)	15 (20)	(15) 20	20	20 (40)	(20-40)	20 (30)	(20)	x	x	(15)	x
WESTERN UNITED STATES TO:												
Central America	(12) 20	(15) 20	20 (30)	20 (40)	(20-30)	(20-40)	(20-30)	20	(15-20)	(10-17)	(10-17)	(10-20)
South America	12 (20)	(12) 20	(15) 20	(17) 20	(20-40)	(20)	(20-30)	(15-20)	x	x	(10-15)	(10-15)
Western Europe	(17) 20	20	20	(20)	x	x	x	(20)	(15-17)	(15)	x	(15-17)
Southern Africa	x	x	x	(20)	(20)	x	x	(20)	(17-20)	(15-17)	x	x
Eastern Europe	x	x	20 (30)	(20)	x	x	x	x	x	x	x	x
Middle East	(20)	(20)	(17) 20	(20)	x	x	x	x	x	(15)	x	x
India/Pakistan	x	x	(15)	x	x	x	(20)	(20)	(20)	(15-17)	x	x
Far East/Japan	(15)	x	(20)	(17) 20	20	20 (40)	20 (30)	(17) 20	(15-20)	x	15	
Southeast Asia	x	x	(15)	x	(20)	(20-30)	(20-30)	20 (30)	(17) 20	(17-20)	x	x
Australia	(10-15)	(10) 15	(12) 15	(15-20)	20	20 (40)	20-40	(17) 20	(17) 20	x	x	(12-15)
Alaska	(12-15)	(12-15)	(15-20)	(17-20)	20 (30)	(20-30)	(20-40)	20 (30)	(20)	(17)	x	(15)
Hawaii	(10-15)	(10) 15	(12) 15	(15-20)	20-40	(20) 40	(20) 40	20 (30)	(20)	x	x	(15)
Western USA	(12) 20	(12) 40	(20) 40	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

produce strong openings that might last only a few minutes, but on occasion the effects may linger for several hours.

For an in-depth look at the sporadic-E phenomenon, I suggest that you read "Mid-Latitude Sporadic-E" by Michael Hawk. This article can be found on the Internet on The AM and FM DXers Resource propagation page, at [www.amfmdx.net/propagation/].

73 and happy hunting!

Band-by-band forecast

10-12 meters. Ten and twelve are now in "summer mode" and openings are limited. There should still be some good opportunities into the Caribbean and Latin or South America from midafternoon through early evening, but not much else will be available on a regular basis. Try Eastern Europe or the Middle East just after sunrise, and Japan, Australia, or the Far East in the early evening. Daytime short-skip can range from 1,000 to about 2,000 miles.

15-17 meters. Fairly decent worldwide opportunities are still available on Fair-to-Good (FG) and Good (G) days. Openings will begin about an hour after sunrise and should last until nearly midnight. Central and South America will be quite reliable for a good part of the day, while the western Pacific, from the Aleutians down to Australia, should supply regular openings around midevening. Short-skip will average between 1,000 and 2,000 miles.

20 meters. Around-the-clock opportunities will be available on Good (G) days. Decent opportunities will often be found right after sunrise and late in the afternoon, but the evening hours after sunset will be the best time for strong propagation. Supertime through late evening should support regular pipelines to Europe and the Middle East, but you'll only find "night owls" awake over there at those hours. If you find yourself awake between midnight and sunrise, try working the Central or Western Pacific where openings should be regular and strong. Short-skip will fluctuate between 500 and 2,200 miles.

30-40 meters. Atmospheric noise due to convective storms will play the major role in daily conditions, but there should be lots of activity here during the quieter periods. Good opportunities to Europe, the Middle East, and Africa will be available to stations located in the eastern U.S., while Australia, Japan, and the Far East will be open to those in the western states. If you live in the central U.S., then all of these regions should be available to you at some time during the month. As usual, Central and South America

and the Caribbean will be open to everyone on most days. Short-skip at night will range from 500 to 2,500 miles but will be well under 1,000 miles during the day.

80-160 meters. Propagation on these bands will be spotty due to high QRN levels, but decent opportunities can still be found at night during the quieter periods. Let forty meters be your guide. Eighty and one-sixty are pretty much nighttime-only bands, with short-skip ranging from 1,000 to 2,000 miles, but daytime multiskip is possible into the Caribbean and northern South America. Noise levels are bound to be very high on most days, however, and daytime short-skip will typically fall under 300 miles. 73

ON THE GO

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APRS are very short. The most common ones I see are those telling another station how they can reach you by voice. This is where one of the neatest features of the D700 interface comes into play. It is possible to store text messages up to 31 characters each into function keys F5 through F8. It is handy to load them with your favorite voice frequencies and such messages as "Monitoring 146.52 simplex" or "Call me on 147.39 +." In this way, you can quickly connect up with a station for a more prolonged conversation.

I find that this interface would be very beneficial in a disaster situation. With a Kenwood TMD-700A in the car, I could park in a strategic location and be able to handle short text messages. While this may not be ideal for health and welfare traffic with long lists of victims, it would be very helpful for tactical traffic. This really is far more efficient than using the built-in methods. As I said earlier, there's a real benefit in taking a good product, such as the Kenwood TMD-700A, and making it better. The D700 keyboard interface does just that.

If you're interested, check out the Web page at [www.john.hansen.net].

John is available to answer questions at john@hansen.net or for snail mail use John Hansen W2FS, 49 Maple Avenue, Fredonia NY 14063.

You can order on-line using PayPal. The kit is available for \$40, and the assembled circuit for \$75. The Pac-Tec enclosure is also available at the same location. 73

THE DIGITAL PORT

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concerted effort toward organization. There are about 6 gigabytes worth of stuff on this hard drive, and that is a bunch.

The computer got the notion that it had enough and came up in "Safe mode." Not a good sign, folks. I ran Scandisk, starting in the middle of the afternoon, which took it to a little after sun-up the next day. Then it would play in Normal mode but it looked weak.

Installation of Norton Utilities made the "fix" possible, but it was time consuming. A search for problems in the system with the Norton package revealed about 40 or so, which included a fix similar to Microsoft's defragmentation. That last was about the same length as the Scandisk operation, but it cleaned up and works like a million again and, per Norton claims, the system actually runs noticeably faster. Probably the end of the hairball dilemma, I hope.

That's about it for this session. Hang in there and keep those digital fires burning. I'll look for the shacks with the porch lights on. 73, Jack, KB7NO@att.net. 73

HOMING IN

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connected to a computer, the accuracy and multipath performance comparisons can be documented. In an upcoming column, I'll tell you about a ham who has done just that, with very interesting results.

Notes

1. Moell and Curlee, Transmitter Hunting — Radio Direction Finding Simplified, published by TAB McGraw-Hill, ISBN 0-8306-2701-4. A simple two-meter RDF loop is on page 26.

2. Loop plans in the book include an added "sense" element to resolve the bearing ambiguity. Try that next time!

3. Moell, Joe, "Homing In: Two New Tools for T-Hunting," 73 Magazine, April 2003.

4. Moell, Joe, "Homing In: Dayton Does DF," 73 Magazine, September 1999.

5. Moell, Joe, "Homing In: Wildlife Tracking Update — Burrowing Owls Found, Saw-whets Sought," 73 Magazine, October 2001. 73

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Say You Saw it In 73!

LETTERS

continued from page 8

would be blacked out, all portholes closed, no light of any kind on deck, with all the filaments on so the transmitter could be put on the air very quickly. As if that were not enough, there were four men sleeping in a tier of bunks, and the air became very foul and stuffy to say the least.

There was one good thing: Tokyo Rose, good music, and propaganda that was so "corny" it sent us into fits of laughter.

Don Schulke KF6XF, donschiulke@juno.com. Wayne, I'm an investor and resident of China in the oil business. I've known you, and of you, since the end of WWII, and reading your NSD columns in the 2002 Christmas 73 edition, I find you haven't changed a bit! Poor ole ARRL still gets it both barrels. But here's another shot!

Like you, I'm not trashing the League. But for a short time, I have had an opportunity that will never come again. This is to buy and create a ham ship as described here.

Why me? Because I was an early investor in China. And in recognition of my endurance through the years from socialism to market economy, it is an unofficial gesture that if I buy it and take it out of China, as I have proposed, it becomes my blessing! Otherwise, it will go to salvage; trashed. And this will happen unless action is taken soon.

Once paid for, registration under new ownership, and flying another flag, the ship may return to China to engage in commerce, same as any other foreign vessel. This ship, I recognize as ideal for China seas trade in petrochemicals, the area and the business best known to me for over 40 years. These many islands and countries of different cultures will continue to be exciting and welcome visitors and traders alike.

My call KF6XF is authorized in China. China television filmed our ham club through summer and winter for a two-segment half-hour TV program. Most important was a field trip by train to a high school where students in club T-shirts showed their CW and phone skills. It's on a VCD for China and overseas views. One Canadian reported seeing it, at least. I can send a copy.

Since China has its own League and logo similar to the ARRL, I telephoned my hamship idea to ARRL headquarters. I didn't get past the first person, i.e., the League is not connected with China, doesn't have this kind of interest, and my history relates more to ex-military organizations. This short shrift deflation diverted League as primary interest. The ship is a valid self-supporting business operation as I know it.

Investors, however, want to retain ownership, rather than the short-term operator status I propose of selling stock for buy-back by hams as a seagoing ham shack.

The immediate initial investment for ownership is US \$100,000 of which I personally will put up half, at 0% interest. The gap of \$50,000 remaining requires 500 hams buying 1 share @ \$100 per share covering the purchase. *[This is not a prospectus or stock offering. — ed.]*

An additional US \$50,000 for shipyard haul-out and repaint financed from additional stock sales will then apply.

The ship may be viewed now in Shanghai. With ownership we will accept volunteer labor contributions.

I can supply more info via my stateside contact info: 1575 Howard Ave., San Ysidro CA 92173-1209; 619-428-1500; fax 619-428-1600. 73

NEVER SAY DIE

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don't add much to the data files. It doesn't take a lot of brains to learn to read. The problem is that most people, including Mensans, stop reading very much shortly after almost learning how, so they never build up knowledge for their brains to work with.

My mother read to me from my earliest days, so I took to reading as soon as I learned how. My grandfather used to take me in his lap and read to me after dinner.

The average schoolteacher reads one book a year. Probably a novel. Figures.

What I enjoy about books is that I'm able to get information directly from the top experts and brains of the world through their books. I read with my Magic Marker at hand, highlighting key data. And then, if I have some questions, I get in touch with the authors and talk with them.

The big problem, of course, is finding the best books to read. My *Secret Guide to Wisdom* is a review of about a hundred truly outstanding books I've found.

I had high hopes when I founded Mensa in 1960. I envisioned Mensa think tank groups helping businesses and the government to solve problems. I organized New Hampshire Mensa members into such a group and got them together with Senator Humphrey. He posed the question of how to get government bureaus and departments to stop spending wildly at the end of their fiscal year as a way to make sure that the next year's budget would be increased. The Mensa group came up with a beautiful solution.

I've described this in my past editorials and in my *Improving State Governments* booklet.

We have unlimited memory capabilities. What most people are not doing is providing their memories with information for their brains to use.

Prozac

Didja miss the Prozac article in the July *Discover*? It covered the benefits and drawbacks of the serotonin enhancers such as Prozac, Zoloft, Paxil, Valium, and Effexor. These are the drugs children with attention deficit disorder (ADD), hyperactivity and depression are being given ... and often forced to take.

The article listed the common known side effects alphabetically: abnormal thinking, allergic reaction, anxiety, chest pain, chills, cough, diarrhea, dizziness, drowsiness, dry mouth, flu symptoms, frequent urination, hay fever, headache, inability to fall or stay asleep, increased appetite, indigestion, joint pain, nausea, sore throat, stomach/intestinal disorder, sweating, tremors, weakness, weight loss. Somewhat less common are abnormal ejaculation, abnormal gait, amnesia, antisocial behavior, apathy, confusion, convulsions, decreased sex drive, extreme muscle tension, fluttery heartbeat, hair loss, hallucinations, hostility, paranoid reaction, slurred speech, stupor, suicidal thoughts, temporary cessation of breathing, twitching, weight gain.

Well, I suppose it's easier to put up with those side effects than to stop feeding a child sugar.

Puberty

For thousands of years boys and girls reached puberty at eighteen. A recent study showed that today the average age for boys and girls is around ten! Clearly something has changed radically. And it has changed even more for black girls, where the average age is nine — with 50% reaching it at eight, and (amazingly) 3% "maturing" at three years old! Welcome to the Pepsi generation — the fast food fans.

I know it's a lousy thing to do to cute little creatures like rats, but I'd sure like to see some research reports on what happens to rat puberty for groups fed burgers, fries, and cola vs. those on a raw food diet. You know, burgers made out of growth hormone and antibiotic-laced beef (well done, to make sure it takes a very long time to be digested), plus a bun made from white flour (which has zero nutritive value), fries (made from genetically engineered potatoes

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$10 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively — once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories — where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 7 3. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 100 Editorial Essays: \$5 (#72)
1997 157 Editorial Essays: \$8 (#74)
1998 192 Editorial Essays: \$10 (#75)
1999 165 Editorial Essays: \$8 (#76)
2000 101 Editorial Essays: \$5 (#77)
2001 104 Editorial Essays: \$5 (#78)

Silver Wire: With two 5-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. \$15 (#80)

Colloid Reprint. April 97 article on a silver colloid maker, history, and how to use the stuff. \$5 (#98)

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The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost) — comes to 35 cents a word for individual (noncommercial) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the July 2003 classified ad section is May 10, 2003.

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NEVER SAY DIE

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which have never been tested for long-term side effects on humans) cooked in (rape seed) oil, and cola with 12 teaspoons of sugar per can (plus dissolved aluminum from the can). If the average child's junk food diet doesn't kill the rats before they reach puberty, or they don't kill each other, I'll be surprised if their age at puberty doesn't drop. Oh, lace their water with fluorides and chlorine, right out of your kitchen faucet.

Since there obviously will be no government or industry funding for this research, maybe you can get some kids who can do it as a science fair project. I'll bet *The New Yorker* will be interested in publishing the result and that none of the medical journals will touch it. 73

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QRX . . .

WA6ITF: "Dear Friends, Listeners, (and 73 Readers) ..."

I'm Bill Pasternak WA6ITF, and since 1977, I have been the unpaid volunteer producer of what is today the *Amateur Radio Newline*. You often read our material here in this QRX column. I am here for one reason. In just one word, money. Money to keep *Amateur Radio Newline* in operation.

Simply stated, *Amateur Radio Newline* is once again in deep financial trouble and we need an immediate infusion of funds to keep the service alive and the weekly newscasts coming your way.

Here's the score. As this is being written [April 14], our Support Fund Administrator, Andy Jarema N6TCQ, says that there is only \$24.80 left in the Newline Support Fund bank account. There are also outstanding bills totaling \$661 sitting on his desk that must be paid immediately.

No extensions of time will be given to us. No delays will be entertained. These creditors — namely telecommunications providers — want to be paid right now. Otherwise, our ability to communicate goes away and the news gathering process grinds to a halt. It could happen before the next newscast gets to you a week from now.

Actually, you would not have heard this week's *Amateur Radio Newline* report (#1339) if I had not

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Wise Up & Beat the Odds

NEVER SAY DIE

Wayne Green W2NSD/1

w2nsd@aol.com

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Planet X

Several readers have called, asking if I believe that Planet X is real. No, of course not.

Sure, Mark Hazelwood, in his book *Blindsided*, made a strong case for it coming along in May this year and almost extinguishing humanity.

Well, scientists agree that something has happened in the past that suddenly shifted the poles, causing enormous worldwide destruction. And we know that something is causing the Sun to act up like we've never seen it before. And that something is causing an increase in earthquakes and newly erupting volcanoes. And that the weather lately has been far beyond weird. And that something has caused Pluto and Mars to heat up.

Then there's the disturbing unanimity of soon-to-come pole shift predictions by Nostradamus, Edgar Cayce, Jim McCanney, Charles Hapgood, and a bunch of other prophets with good records.

I wonder what the people who co-existed with those Siberian woolly mammoths that were flash-frozen with tropical flowers in their mouths thought the day before the last time the poles suddenly shifted?

Does Planet X come along every 3,630 years and on some passes shift the poles, wiping the slate clean as a bonus?

No, I don't believe Planet X is real, no matter what Zacharia Sitchin has found in the ancient records, or all those prophets say. But, I'll

sure breathe a lot easier if we're all still around this summer sweating out how Bush's domestication of Iraq is going.

Webbing It

More and more amateurs are integrating their operating with the Internet. There are things that are easier on the Web, and things we can do better on the ham bands ... so why not combine them for the betterment of both hobbies?

For instance, I was just reading in an ATV newsletter that more and more ATV repeaters are being interfaced with the Web, allowing hams just about anywhere in the world to swap videos over local ATV repeaters. That's great!

W7DXX, a couple years ago, set up his station so it could be operated remotely over the Web. The first user was a ham in Hong Kong.

When I visited Art Bell W6OBB in Pahrump NV recently, Art's wife Ramona took a digital picture of Art and me which Art then sent to the group on 3840 via slow scan. He also sent a copy to me by E-mail, and the whole deal from taking the picture to delivering it over the air and via the Web took about two minutes.

Fun? You bet. So let's get more hams having fun like this. And that means I want to start seeing ham/Web articles being submitted. I want to know how to interface my rig to the Web. What software do I need and where can I get it? How can I start swapping

videos via my eMac via the Web over ATV repeaters? How about connections to voice repeaters around the country? Heck, around the world? And bring the readers up-to-date on high definition color digital pictures via slow scan.

Let's make 73 the magazine to look to for Internet/ham interfacing and operating. If you've been participating in this mischief, tell us about it. Let's get the readers excited and busy upgrading their stations.

What I Believe

The conspiracy buffs are having a field day with those ex-towers ... and I don't believe them for a minute. I believe the government. Never mind that the government lied to us about the Oklahoma City bombing. And about Flight 800 being downed by a missile. And about the Roswell UFO crash. And about Area 51 not existing. And about Amelia Earhart being lost at sea. And ... and ... and, etc.

I don't believe there was a 1200% increase in short orders on American and United Airlines stocks in the week before 9/11, even though this was reported by the Chicago Securities Exchange, and that there has been no official investigation.

I don't believe that two of the terrorists went to a topless bar a few nights before 9/11, spent over \$200 each for lap dances, and left their business cards and a copy of the Koran behind. Fundamental Muslims don't drink ... it's against Islamic law.

I don't believe that a group of Israelis, here without permits, were caught filming and cheering from the top of a building in Jersey City, New Jersey, as the Towers were being attacked — and then were allowed to return to Israel.

I don't believe that Secretary of State Madeline Albright (Clinton's appointment) turned down the offers of both Yemen and Sudan to extradite Osama bin Laden.

I believe that even though six of the eight pilots on the four flights had military backgrounds, that they were overwhelmed and killed by hijackers armed only with box cutters without being able to send out any alarm.

I don't believe that experienced pilots claim that the maneuvers the planes made to hit the towers would be virtually impossible for any but the most advanced pilots.

I believe that the information in all of the black boxes was destroyed, as the FAA claims.

I don't believe that Flight 93, which crashed in Pennsylvania, was shot down ... that the debris was scattered over an eight mile radius, that the largest piece was the size of a telephone book, and that residents of the area heard a loud explosion and saw a military jet.

I do believe that the terrorists permitted the passengers to make phone calls from the plane to their families.

I do not find it strange that though the FAA knew Flights 11 and 175 had been hijacked, that when an F-16 was finally scrambled, that it was ordered

to proceed at a conventional speed, even though the pilot requested permission to go full speed ahead. Or that Flight 77 was in the air for 43 minutes after the FAA knew it had been hijacked and was headed for Washington DC, and yet no fighters were scrambled ... even from Andrews Air Force Base, minutes away.

I do not find it strange that the steel in the towers melted, even though steel melts at 2700° and jet fuel burns at 1800° at the highest ... and that much of the jet fuel burned outside the building.

I don't find it strange that the FBI was able to come up with the names and pictures of the hijackers within days of the attack.

Nor odd that the FBI found Mohammed Atta's bag, which somehow didn't make it on the plane, and it was loaded with incriminating evidence. But I do wonder why a terrorist bound on a suicide mission would check a bag for the flight.

And how about the amazing coincidence of a hijacker's passport surviving the crash into the tower and the ensuing fire, to be found by the police in the street unharmed? I love coincidences like that.

Yes, of course I believe the official casualty numbers. Why would they lie? But I wonder how thousands upon thousands of people were able to get down the three usable narrow single-lane stairwells in the panic, and do it in the few minutes between the planes crashing into the towers and their collapsing. And this while the firemen, with their equipment, were trying to go up the same narrow stairwells. A miracle!

And I marvel at how considerate the hijackers were of the Jews, whom they hate even more than the rest of us, yet they struck the buildings on Yom Kippur, a Jewish holiday, assuring that few Jews would be in the buildings that day. The choice of a major Jewish holy day could hardly have been a coincidence, since the attack had to

have been planned far in advance. It's kinda like the coincidence with the Murrah building bombing in Oklahoma City, when the FBI staff didn't come in to work that day. Think of the odds!

A Plan

Forty years ago, back when I started 73, when I went to an IEEE show, most of the top people I met in the electronic industry were hams. Same thing at the military electronics shows. Why? That's simple — because, according to an ARRL study at that time, 80% of our ham newcomers were teenagers and 80% of those went on to high-tech careers.

Today's teenagers have never heard of ham radio. Where would they hear about it? When is the last time you saw an article in the paper about our hobby? Or anything on television? Or heard about it on the radio? Or in a magazine article? We've become invisible unless a kid's grandfather happens to be a ham.

Our electronic industries are having to import their technicians from India, China, and other countries because we have so few Americans available. Less than half of our university engineering graduates are Americans.

So, what can we do about it? What can you do about it?

Two things.

First, we have to make ham radio visible to teenagers. We have to let them know the hobby exists.

Second, if we're going to get kids into ham radio, we have to get them excited about it. And that's where you can help right now.

Has ham radio ever provided you with any adventure or excitement? Okay, get busy and tell the story. Write about it and send it to me. I'll put your story on the Web, where teenagers will be able to read it and find out how much fun they've been missing.

That's the first part of the solution — now, how do we get the visibility it takes to get kids to the Web site? How

do we get the buzz started? The easiest way is the most fun way — by talking. That's something we presumably are good at. But I mean on talk radio shows, not on the ham bands.

Almost every radio station has a talk show, and they're really hurting for interesting guests. There are thousands of talk shows and they all need new guests every day.

Okay, here's the drill. First call every radio station in your phone books and ask about their talk shows. Get the name of the shows' producers. Next, send a short letter to the producers explaining why you'll make a good guest. Pose a question, and then answer it. "How can we interest teenagers in high-tech careers — where the big money is? By getting them interested in an exciting high-tech hobby like amateur radio."

Then briefly explain the excitement and adventure hamming has provided you and add a short bio.

Give the host some sample questions: How expensive is the hobby? How can a youngster get started? How difficult is it to get a license?

Be persistent. Never Say Die.

It's that easy.

There's nothing wrong with amateur radio today that a few million teenagers entering the hobby won't fix.

Yes, of course I'll publish an inexpensive book with reprints of the most interesting stories I get. That'll be for the few teenagers who have learned to read.

The Ramsey Catalog

Wow! 48 pages of kits and gadgets that really got my juices going. All kinds of QRP stuff, test equipment, AM and FM broadcast transmitters, an ion generator, a Van de Graff generator, laser-beam communicators, lots of security stuff, underwater video camera systems, all kinds of antennas ... it goes on and on. Give 'em a call and get your copy ... 505-924-4560. Now, what did I do with my old workbench?

Am I Blue?

The drug industry is getting concerned over the word getting out about silver colloid being a better antibiotic than anything they're selling. It seems to be the only antibiotic that germs can't compromise and it's unpatentable, so no wonder the concern.

Their poster woman managed to turn blue as a result of too much silver. From silver colloid? No, from nose drops. I'm lucky I didn't do the same. Not long after my first childhood vaccinations I got serious ear infections and then a sinus infection that lasted for over three years. My mother tried to clear my sinuses first with ephedrin drops and then, for over a year, with Neo-silvol. Nothing worked. I was unable to breathe through my nose for even an hour all those years. It's amazing that I didn't turn blue from all that silver.

Yes, I believe it's possible to turn your skin gray or blue if you drink enough silver colloid, but I'll bet we're talking 500 ppm, not 10 or 20 ppm, which is what I recommend people take.

I don't see any big benefit in drinking the stuff on a regular basis, but I've had many people call who have been drinking a few teaspoons of it every day for years ... and still can't pass for ETs. I keep some on hand in a brown bottle and take some if I feel like something might possibly be coming on.

The stuff is so easy to make that it's pathetic. I've been busy filling orders for my silver colloid kit (#82 in my catalog). It consists of two 5-inch lengths of #10 (heavy-duty) silver wire, a small power supply that plugs into the wall, an instruction sheet, and a reprint of an article on making and using silver colloid. The whole works, by priority mail, sells for \$37... one of the better bargains out there.

You open the box, put the wires in a glass of distilled water along with about two

Continued on page 7

continued from page 1

made partial payment on some of these bills out of my own pocket. But candidly, that's it. I just do not have the money to keep *Amateur Radio Newsline* going all by myself.

For those of you who do not understand where the money is spent, let me lay it out for you. The biggest single cost is worldwide long distance telephone service. For example, I just got off the phone after talking to a ham in Kuwait City who had news of possible resumption of Amateur Radio in Iraq by broadcast engineers assigned to news bureaus. Calls like this are how we get most of the news that we deliver to you.

Even with the discounts we have negotiated through long-term contracts, a 12-minute call like this does not come cheap. But it is the price we pay so that we can bring you the most accurate and up-to-date news regarding amateur radio operations worldwide.

Currently, it costs *Amateur Radio Newsline* an average of \$500 to \$600 a month in long distance fees. And this is in addition to the cost of normal local phone service and any domestic long distance — the latter also negotiated at deep discount rates. Summing it up, the telephones total close to \$800 a month. Sometimes a bit more. Sometimes a bit less. But \$800 is a solid average these days.

But that's not all. There is also the cost of high speed Internet access, Web site hosting, file transfer space (FTP site), and everything else that comes with maintaining an interactive home in cyberspace. That's the home that we must retain to get the news out to you. It's called [<http://www.arnewsline.org>].

And there are still tape cassettes and portable recorders. Yes, we still use good old cheap audiocassettes and mostly Sony consumer recorders to gather the news. And we go through quite a few tapes every month and a recorder or two a year. Even at the wholesale prices we pay, it's still an average of \$20 to \$30 for what we use.

That's assuming that nothing goes wrong, of course. That nothing breaks. Or that on-line protocols do not change, and necessitate expensive software upgrades. So you see, the total cost of bringing you the news is over \$1,000 a month, or about \$250 a week.

Some of you will say that this is an awful lot of money, so here is a point of comparison. As some of you know, I work in the broadcast industry. As such, I can tell you that amortized across the business day, it costs the "average" local television station around \$1,000 to \$1,500 per hour — depending on the market — just to cover a single story that may run 30 seconds on a newscast. If they fly a news helicopter, you can add another \$700 an hour.

And that's local news! International news coverage costs a lot more than that. When you compare our rather meager budget with the news department of an "all news" local radio station,

it's easy to see that *Amateur Radio Newsline* has learned to squeeze a nickel so hard that it yells "Uncle!"

The reason we can do this is because there is no paid staff. Everyone — this writer included — and the corporation's Board of Directors — is a volunteer. We have no salaries to pay and none of the peripheral expenses that come with maintaining a full-time group of employees.

But, what if something does go wrong? What if a fax machine or cassette recorder breaks and needs to be replaced? Or a computer dies and needs to be repaired? Or we are faced with a mandatory software upgrade because providers no longer support the software that worked just fine three days ago?

Well, it works this way. If it's a "must do," I pay for it out of my own pocket and hope that donations will cover it at some later date. That's the way that it has been since 1977, when I took over the then Westlink News Service from Jim Hendershot WA6VQP. And believe it or not — that's the way it is, to this day!

If anyone else on our all-volunteer staff has a problem, they fix it and submit a bill. If there is money in the account, they get reimbursed. No money, and they wait. No bill submitted — no repayment.

And — oh, yes. There is the \$1,100 or so that it will cost us this August to present the Young Ham of the Year Award. Yes, Vertex-Standard and *CQ Magazine* cover all the expenses of the youngster chosen to receive the award, but we have to pay to send a representative to Huntsville, Alabama, to present the award and also — this is a biggie — cover the costs of the mini-banquet to honor the youngster the committee has selected. (The Huntsville Hamfest, like most amateur radio shows, discontinued its annual banquet several years ago.)

I was just over on ORBITZ.com, the airline travel site. I plugged in Burbank, California — the airport closest to us — and Huntsville, Alabama, as the destination. This year's fare for this summer — the 21-day, discounted purchase price, is \$543. And that's if we buy it now — before prices go up in early May. And we would — if we had the money to do it!

Here's the bottom line. I am a working stiff just like the rest of you. So are all of those who volunteer their time and talent to producing these weekly newscasts. I can personally help out with finances in a real pinch, but I am not made of money and cannot keep shelling out what it costs to keep the *Amateur Radio Newsline* newscasts coming your way. The money just isn't there!

If you want *Amateur Radio Newsline* to continue, you will have to vote "yes" with your checkbook, and you have got to do it right now! Today! Not next week or next month. Today is it!

Again, this is the bottom line: If we do not raise the \$661 immediately, and an additional \$1,000 a month — every month — month after month

after month — we will be gone and we will not be back.

Remember, *Amateur Radio Newsline* is a federal, 501 (c)(3) non-profit corporation. Your contributions are tax-deductible. So we end this far-too-long announcement with the address for the Newsline Support Fund, PO Box 660937, Arcadia CA 91066.

OR ... Look us up if you are at Dayton ... We'll be happy to give you a receipt, hi.

We hope that you will respond and that this week — or next week — will not be the last week we bring you the news. Let's hope that it can, and will, continue to be with you for weeks, months, and years to come. Either way, it has been a great 26-year-run — and we thank you for supporting us over the years.

Bill Pasternak WA6ITF

President, ARNewsline, Inc.

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Space and Science: SETI@home

The SETI@home screensaver that crunches data in search of intelligent signals from space has produced a list of candidate radio sources that deserve a second look. Scientists behind the project will use a giant radio telescope to take a second look based on this data.

SETI@home is more than the usual screensaver. It's actually a very high-tech data processing program disguised as a screensaver. It springs into action after a computer is idle for a given length of time. Its purpose is to analyze radio telescope data downloaded to the machine over the Internet, search for strong or unusual signals from space, and file a report back.

Many hams worldwide have embraced SETI@home and have it running around the clock on their PCs. They are the first to tell you that the project is in keeping with the spirit of amateur radio itself. What is important is that SETI@home has performed the most sensitive and detailed SETI sky survey to date, has demonstrated the power of the Internet for doing scientific distributed computing, and has allowed the general public to participate directly in exciting research.

So far, 4,287,000-plus users have lent their spare computing time to analyze radio data for the SETI@home team. You can become a part of the project by taking your Web browser over to <http://setiathome.ssl.berkeley.edu>.

Thanks to W6RCL, and K2SSQ, via Newsline, Bill Pasternak WA6ITF, editor.

NEVER SAY DIE

continued from page 5

grains of salt to make it conductive, clip the two power supply wires on the wires (yes, the power supply wires come with alligator clips attached ... nothing to solder), wait about 20 minutes, and you've got 10 ppm silver colloid solution for about two cents a gallon.

The stuff is recommended by many experts for any rash, wart, infection, athlete's foot, jock itch, psoriasis, and so on. It's also perfect for rinsing any food that might have germs ... like E. coli and salmonella on chicken, or anything on fruit or vegetables that may have come from some other country.

Service

One thing that makes it so difficult to learn English is that so many of our words can have several meanings. Like

the word "service." It can mean doing things for people, like (sort of) the Postal Service. Then there's Internal Revenue Service, which brings to mind the term used by farmers of having their cows serviced by a bull.

French Fry Alert

The next time they ask, "Do you want fries with that?", the answer is NO!

Outside of the fact that all cooked food is considered toxic by our immune systems and eventually will lead to stopping your body's engine via cancer, heart attack, or something else terminal ... and therefore you shouldn't be ordering anything that will trigger such a question. And never mind any boycott of anything French. Hey, does that also include French vanilla ice cream? Oh, what we have to give up to be politically correct!

Anyway, this screedlet has

to do Acrylamide, a very toxic chemical used in manufacturing plastic. This stuff has long been known to help cause malignant cancer, severe nerve damage, and DNA mutation which can carry on to one's children.

Last year, for some reason, the Center for Science in the Public Interest ran tests which showed that the amount of Acrylamide in a large order of fast-food fries was at least 300 times more than the EPA allows in a glass of water.

So where did it come from? Further research showed that when any food is fried, especially deep fried, and particularly starchy foods like potatoes. Acrylamide is produced. Hmm, starchy ... like maybe doughnuts?

No wonder our police are edgy ... on a diet of coffee and doughnuts. As I've mentioned before, coffee is a mind-altering stimulant that produces a surge of nervous energy ... and then leaves

you exhausted, depressed, irritable and short tempered. Caffeine stimulates the brain cortex, causing poor memory, poor balance, fatigue, anxiety, hand tremors, hostility, headaches and dehydration. Researchers claim that it takes two or three cups of water to overcome the dehydration caused by one cup of coffee.

And sugar? Wait'll you read Nancy Appleton's *Lick The Sugar Habit*. Sugar is infamous for causing arthritis and boosting your cancer probability.

Any fried food includes those delicious chicken wings and KFC agenda.

Most authorities agree that the huge increase in cancer has been caused by our diet change over the last hundred years.

What percentage raw food have you achieved so far in your diet? You know, like apples, bananas, oranges?

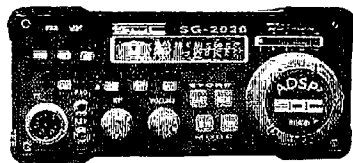
Continued on page 28

GOT NOISE?

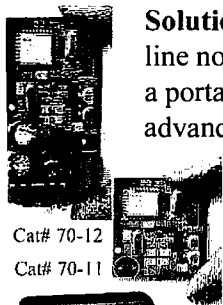


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LETTERS

From the Ham Shack

R.A. Appleyard VE3YAG. Wayne, this letter will warm your kit and homebrewing heart. My six-year-old son wants to build something for his mother, so I have ordered a catalog from Ramsey Electronics, and I mentioned your superb, well-written magazine too, and Ramsey is forwarding one to me. If my six-year-old is ambitious to build a kit, what is wrong with the rest of us hams?

Wayne, after I assist in building the kit, it will be entered into the VE3DC Hamilton Amateur Radio Club Crawford Trophy homebrew competition. The challenge is. Let's not have a six-year-old show us up.

My daughter, 12, for about the last 10 years has wanted to be a physician, and that has been her focus in life — plus, she wants to be a ham.

One comment, Wayne — Incentive Licensing keeps many hams from using many frequencies that otherwise would be available, especially Novice and Tech. If 80/40 are down and 10 is mainly daytime, they have nowhere to go. Maybe a class system like Canada Basic and Advanced. Advanced here in Canada can run more power, operate repeaters and club stations, and build transmitters. Basically, Wayne, the caste system has to go, and all hams are on the same level of equal access to all frequencies, or one day we will lose all frequencies. Me, I am a Basic with 12 wpm endorsement and quite satisfied, and when I get time, I will obtain my Advanced.

Looking at the Icom band chart, all those hams with no privilege of operating there gives the commercial operators more leverage at auction time.

Finally, CC&R rules and regulations. Why use a sledgehammer to kill a fly? If an amateur is moving into a restricted area, why not produce sketches to show how the antenna would look, especially if you can blend it in with the landscape? Show them your shack. Inform the board that an antenna provides lightning protection. If you reside in tornado or hurricane alley, you can provide timely warning, and when disaster strikes you could be the only link to the outside. If there are serious injuries, it will be a life-or-death matter in response time, so let's stop running to Big Brother and solve our own problems.

Wayne, if you do have an acid tongue it is only because you have hit the nail right square on the head.

Or something like that. Thanks. — Wayne.

Jack Sauers, Seattle WA. Wayne, it was nice to receive your letter. Perhaps the northern expansion of the South Atlantic currents from Antarctica will be another aspect of the death of the Gulf Stream farther north. Maybe those Magellanic penguins know something Al Gore doesn't. Cold waters increase the plankton growth, and that increases the sardine and herring, and furnishes good munchies for the penguins, which headed 2,000 miles north, since the Antarctic Ocean is cooling during this La Niña, and pack ice has gone out to over 33 miles from the one mile during the last El Niño year of 1998.

A much slower process is the increase in mass balance of the 25,000,000-square-mile Antarctic Ice Sheet, which is going up, from satellite altimetry at 0.2 meters, or 8 inches a year, increasing by 200 gigatons in glacial ice per year. From my estimates, in excess of 1,000 gigatons a year calves off in mostly shelf ice each year, still further cooling the Antarctic waters in this Ice Age that's already started. I think it's humorous it sneaked up on Al Gore while he was pontificating on global warming, and decrying fossil fuels and their emissions on burning.

You don't need a computer, calculator, or even a pencil to compute the excess glacial ice going into the South Pacific and Atlantic. Simply take the 4 feet coming in around the ITT Towers each year. Subtract the 8 inches equivalent to 200 gigatons from 48 inches. That leaves an excess of 40 inches. That 40/8 is 5 times the 200 gigatons, or 1,000 gigatons that's going out into the Atlantic and Pacific from Antarctica. That's a huge ice cube, which should be cooling the water all the time, and smoothing the shorter-term El Niño-La Niña Oscillation. Since from Vostok Ice Core data, the oxygen isotopes' temperatures down in the core is showing Antarctica cooling since the mid-Twentieth Century just like palynology data, and dendrochronology data. Al Gore uses manipulated junk science from corrupted meteorologists, who never hear of real-world data. Newsweek is a crapped up publication, infested with liberals like our local papers here.

Cold water coming north along our Washington and Oregon coast, has also increased plankton, sardines, herring, and other fish, so catches are up.

Increased calving of glaciers into the seas is because the glaciers are increasing their advancing and increasing mass balances.

Global warming is a scam, a hoax, and a con game by totally irresponsible power-greedy people with no scruples. I have thought several times I should just stand back and let everyone find out what the natural climate has in store from natural cycles, the hard way (like in the past).

You will seldom see the proponents of anthropogenic warming even discussing the natural cycles that have run the climate in the past, because they are not competent to do so. Most meteorologists are functionally illiterate in estimating the interdisciplinary nature of real-world climatology, during the tenure of this totally corrupt administration.

So I decided to become more familiar with the 100,000-year cycle. It may in actuality be a Milankovich cycle plus an added solar cycle, that's a multiple of solar sunspot cycles; a fundamental harmonic, that can be plotted on a log graph, as a linear ascending line, or perhaps zone, like in research I was doing on data sent me by Prof. Emeritus Rhodes Fairbridge of NASA, and formerly of Columbia University (who has my added research interpretation).

My glacial terrace research, I have now plotted up on perhaps 28 USGS 7.5 min. quads, at a scale of 1:24000. I was fortunate that I had that scale, and such a fortunate contour interval where it's easy to recognize that there's a time sense to the contours when calibrated against sea core data that shows the 100,000-year cycle. When that is done, 40 feet is equal to 10,000 years. 400 to 100,000 year cycle. Except for the last one. Cascades went up 1,600 feet in the last 100,000 years.

I finished this study and sent all the quads to my editors at 21st Century, which produced my first map for publication.

My last map was Mt. St. Helens, and Mt. Mitchell south of it. The rate of uplift has been 2,600 feet in the last 340,000 years, from the terraces, or about half that in the Northern Cascades, or even Mt. Rainier. There is the old Pliocene erosion surface at 6,000 feet in elevation, with just a skim of volcanics. I have told both the USGS and FEMA about this. But even there under both volcanoes the rate in the last 100,000 years is up by 1,600 feet, increasing orographic effect strongly.

They know about my research. Short descriptions of the involved quadrangles studied were sent to my editors. They have been authorized to publish this, and the maps, or put it up on their Web site at 21st Century. It will be interesting to see what happens.

If you can struggle through this letter you are welcome to use any of it.

The Neotectonic uplift of the Cascades has been one of my more interesting studies, though an outgrowth of 50 years of geologic research, a huge amount in the field. Rhodes Fairbridge thinks I must be one of the last boots-and-hammer field geologists left. There is an intimate relationship between physiography and structural geology, not really used as it should by present-day academia, like a hundred years ago. Professors today like warm offices in winter and air conditioning in summer. I wonder if computers are an excuse for not doing hands-on field work.

What I have been melding together is old, lost research, with modern-day methodologies. By the way, we have as a result of global cooling a West Coast energy crisis with a possible power shortfall, according to Seattle City Light, of 10%. They tremble at the thought of the Arctic Express this winter. They had better get their asses in gear and give up on the failed linear global warming hypotheses. They have already warned of rolling brownouts this winter, and raised power rates; but remain brainwashed by

global warming. Guess they will have to learn the hard way. Wait until eventually this range fills up with ice again, which will wipe out their power plant dams, though the glaciers are growing already, so they will have plenty of hydro water, for a while.

Water is indeed falling around that Pacific atoll. Sea level is falling by 1 to 1.2mm a year, going into Antarctica. I would not try to tell anyone to move south. Buy long underwear — polypropylene, 3 pairs.

I'm thinking of doing next year's forecasting calendar.

When everyone finds out what's happening, it might get very crowded down south. Looks like time is running out on Al Gore, too, like global warming. Four feet of new snow in the Cascades, that's more than expected. Maybe even down here they are gearing up new snow removal equipment. 61SPZ data indicates, like a flickering switch, a major climate change can come in a three-year period. The next La Niña 2003–6 could be worse than 1993–6.

By the way, the Kebnakaise Mtn. in northern Sweden is going up at the same rate as the Cascades over the past 800,000 years ... 4,500 ft., and has the same last big U-shaped cross

valley profile indicating 1,600 ft in the last 100,000 years in my analogy of that quad I did for a professor at the Univ. of Stockholm, from the map he sent me. 800,000 years ago it was as flat as the Canadian shield in Sweden. That mountain is now at 1,500 meters with elevations like Table Mountain and similar glacial terraces and intervals in between.

Randy Moeller KI7MU. Every now and then, my wife and I take a look at our distilled water, raw food, full-spectrum lighting, books on child-raising, Scott Kirby's CDs, etc., and say, "We sure owe a lot to Wayne." You have made a huge difference in our lives.

Thanks, to the tenth power! We're going to have our first baby in a few weeks — he's responding well to the Prenatal Classroom lessons — and I love playing the "kick game" with him. We're also using a device called "baby-plus," which is a flannel bag with speakers. The mother straps it around her abdomen for an hour twice a day and it plays a series of rhythms that get more

Continued on page 62

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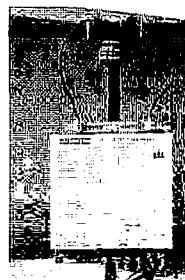
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QRP Antenna Showdown

What's the best antenna to use with your QRP rig?

More often than not, when you hear someone ask this question, they are looking for answers more in line with those for a query like, "Which antenna is going to give me the biggest signal, or the most contacts?" That is, they are talking strictly performance.

How any antenna performs is a very important characteristic, without which there would be no wireless communications. However, if we can set aside an antenna's performance ability for a moment and give consideration to a couple of other important characteristics, the question stands a better chance of being answered correctly.

All too often the individual asking the question has not given thought about two other very important considerations for

portable use; the intended "use" for the antenna and a familiarity with what's "available." Once the user understands and becomes familiar with these two issues, then performance can be given its deserving consideration as a determinate in deciding which antenna is best.

I have been told that religion, sex, and antenna "stuff" can be taboo discussion items. However, after having heard so many QRP hams ask this very question regarding best antenna selection, I feel

the need to run the risk of being involved in such a taboo discussion. Note that I don't plan to include cost and ultimately "real value" into this discussion. The variables involved with real value are so numerous that this would be an article all its own!

It is not my intention to dwell into the performance aspects of these antennas either. The myriad of details is mind-boggling. There have been antenna shootouts conducted under controlled testing conditions that better provide results comparing one antenna to another.

Even more important than performance, the first step to finding the best antenna for your needs is to identify where and how you want to use your QRP rig the majority of your on-air time. For example, you might decide that ultimate mobile performance can be obtained by mounting a three-element beam on a 10-foot pole attached to the rear bumper of a minivan. Performance should be very good, but aside from looking silly and being expensive, it's unsafe and might not even be road-legal! Yet, there are several low profile antennas that are better suited for mobile, providing practicality over ultimate gain.

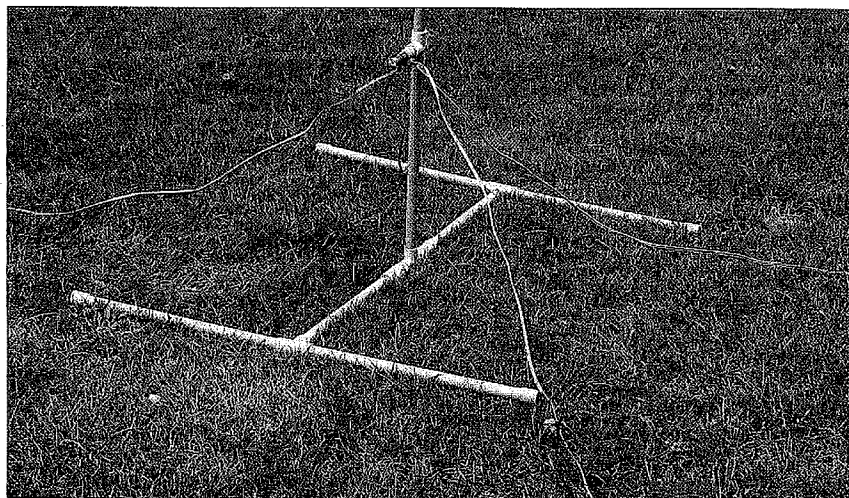


Photo A. Mounting base standard with the Minute Man 20.

Or, if you're a hiker, a long wire antenna gets a little clumsy, if not impossible, on those mountain trails. Again, not a good choice for the specific application, in this example a pedestrian portable use. Thus the need to determine where and how (usage) the flea-powered rig will spend most of its "ON" time is the first consideration that needs addressing.

Another example of the importance of identifying usage lies with the simple rubber duck antenna. Consider this fact: There is no better antenna than the rubber duck type attached to a handheld rig while walking around a hamfest. Here you don't want directivity, don't need gain, and don't want anything protruding up into your sides when you're bent over picking up a prized goody. The right antenna for the right job!

Moving right along, let's first examine the basic groupings of the ways your rig can be pressed into service, and then examine what supports each.

Group 1: Pedestrian/fixed portable operation such as hiking, public service volunteering, and fixed such as sitting up on top of a mountain peak.

Group 2: Mobile operation such as in an auto, motorcycle, bike, boat, airplane, etc.

Group 3: Fixed station (home) use of the base station antenna.

Hams, the versatile lot we are, will likely try all three groups. However, after the experimenting is done, most will usually settle on one or the other. Within that one category, most operators will drill down even further, settling on one or two sublevels of the group.

For me, my FT-817 spends most of its time in Group 1 (fixed portable) and sometimes Group 3 (home). Thus, I have appropriate antennas that offer me the best performance within the limits imposed by the constraints within these two groups. Within the boundaries of my Group 3 hamming, I am restricted by my XYL, not restrictive covenants or CCRs!

I've listed some characteristics that I have found KEY for each of the 3 groupings. See if you agree and/or can add or change those characteristics

that are more meaningful for your specific application.

PEDESTRIAN/FIXED PORTABLE. For hiking: reduced size, light weight, attaches directly to the radio, minimize the use of interconnecting coax, no radials (regardless of the improved performance); consider monobanders. For fixed portable operation at the family's beach cabana or on a mountaintop: some gain and directivity could be useful and easy to handle; any required rotation of an antenna should be the "Armstrong" rotation method; antenna, pole, and accessories should be easily assembled/disassembled and packed; may consider a reduced size and/or lightweight antenna if climbing is part of the trek to the operating site.

MOBILE OPERATION. The key nonperformance criteria here are physical characteristics such as wind loading and mounting methodology. Wind loading is a mechanical metric that you'll usually see offered by the manufacturers on larger, permanent installations, and hardly ever provided for the typical QRP/portable genre of antennas. However, you don't really need to be a mechanical or structural engineer to figure out if your antenna choices could stand up to whatever the fastest speed you'll be traveling is. Size as well as geometry of the elements must also be considered for mobile applications. A horizontally rigid dipole cut for 20 meters, regardless of how durable it is and how well it is welded to a motorcycle's frame, is probably not the best choice of this application!

FIXED STATION (HOME). A fixed base station QRP antenna installation usage does not have many of the same physical property limitations as the portable and mobile application does. However, depending upon city, state, and federal regulatory laws, the antenna choices may not be any easier than the above two. In my experience living in homes that had restrictive covenants (CCRs), I almost always had to go about practicing my hobby in somewhat of a clandestine fashion. At one such house I decided to run my coax line to the mobile antenna on my parked car in the driveway, and use

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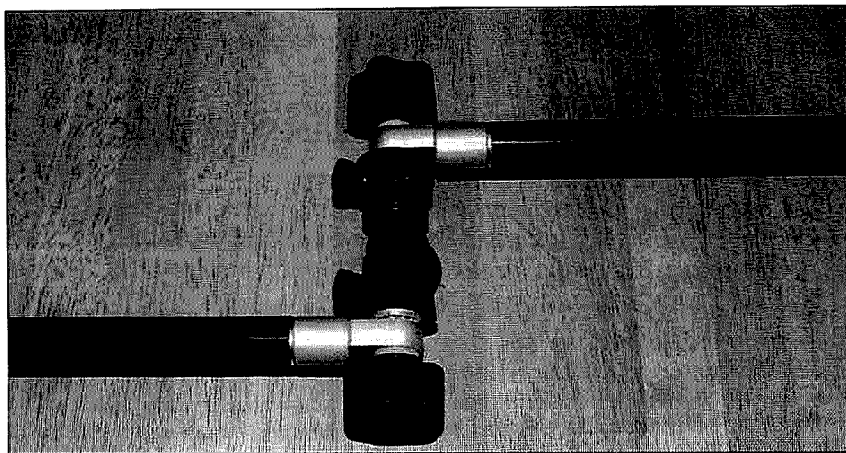


Photo B. Center insulator and position adjustment knobs for the Buddipole.

small magnetic loops on portable tripods. Longwire antennas made from very-small-gauge wire, tapping into the metal gutter system, or the concealed vertical within a fiberglass flagpole can all be made to work very well. Regardless, you'll need to keep size, weight, and the ability to be stealthy in mind before you settle on your antenna choice. Further information on dealing with CCRs can be found in the FCC's PRB-1 bill at [www.arrl.org].

Should you be one of those who lives where there are no restrictive covenants, then you're limited only by "best practices" techniques. Lucky you!!

What's available

QRP operation is not new. However, today it is credited for getting many

hams back on the air. It is *so* popular that numerous manufacturers have begun marketing QRP-specific rigs coupled with a full array of accessories. My last (unofficial) count revealed that over 25 different antennas were being marketed as specialized QRP/portable antennas.

Almost weekly, new antenna products are appearing in magazine ads. Keeping up with all that's available is difficult and expensive. Over the past couple of years, I have acquired six commercially made portable/QRP antennas. As a way to assist in categorizing usage to decide what works best for your application, I've developed a table comparing my antennas. Within reason, you'll find that these six antennas fall somewhere within one of the three groupings above and represent a

good cross-section of today's QRP/portable antenna offerings. A lot of time has been spent assembling, disassembling, transporting, testing, evaluating, and developing my personal opinion as to where these six antennas fit.

In your judgment I may be off base, and that's OK. It's like taboo subjects: There definitely are no two opinions exactly alike. There are many good antennas on the market in addition to the six I listed here. The object here is the same when making the comparisons.

The chart I use lists 10 categories, each exhibiting a numeric score from 1 to 3 with 3 being EXCELLENT, and 2 and 1 being OK and WEAK, respectively. The scoring is very subjective and opinionated. The values you see are those I placed on the antennas, my call. You can accept my values or alter them as you see appropriate. The end results should fit your needs and usage, other than performance as discussed earlier in the article. Addressing the usage within the categories is what's important. The rationale I used for scoring is as follows:

Frequency coverage: More points are given to those antennas that are multi-banded. If my specific applications were for a single band only, I would reverse this scoring.

Size, assembled, and disassembled: Smaller is important.

Ease of setup and teardown, including initial tuning and band changing: I don't want to spend a lot of time putting together the antenna, having to read a lengthy instruction manual, and having to pretune or trim parts of the antenna. (I don't do well at Christmas-time assembling the kids' toys either!)

Portability when assembled: Specifically, can I easily walk around with the antenna attached to the rig if I want to use the radio while hiking?

Self-supporting/standing: If I decide to operate when stationary, will I need to provide some sort of pole and stand or wire guys to hold the antenna?

Quality of construction: Material selection, workmanship, appearance, all lead to product longevity. The repetitive process of assembling and disassembling the antenna is going to be the litmus test for durability.

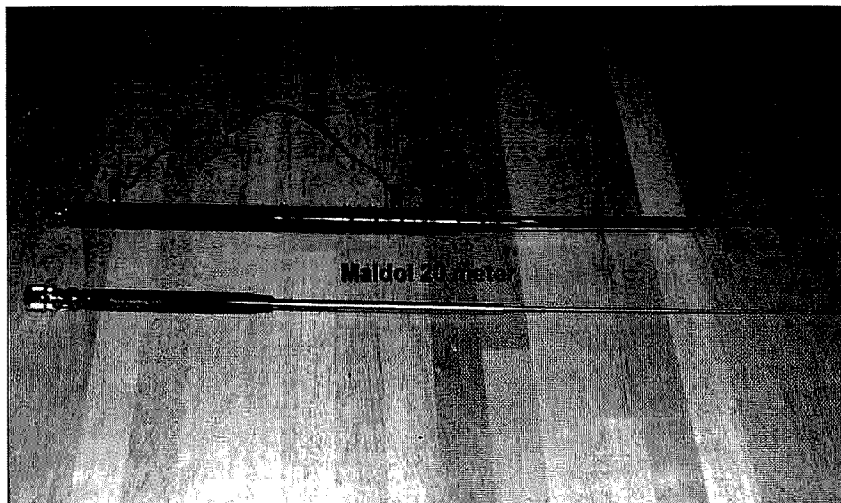


Photo C. The MFJ-1899 (ATX) and Maldol monobander antennas.

Wrapping up

Nothing is cast in concrete, that's for sure. If you add up all the data points on my chart for each antenna, you will notice that the Miracle Whip scored a perfect 30 points! You may or may not agree that the Miracle is excellent in all 10 nonperformance categories, but don't forget, a 5 watt, 50 ohm resistive dummy load would exhibit all the favorable nonperformance characteristics I've identified and scored excellent in the same categories.

Now it is up to you to insert a value, or better yet a multiplier, for performance. Performance data can be obtained from your very own experience or from organized efforts such as the HFpack [www.hfpack.com] group antenna shootout results. If all else fails, you could use the manufacturers' published performance specifications. If you do, make sure that all results are in the same unit of measure, dBs or dBi, etc.

I did not include the way I chose to factor performance but when I was done, the results can be seen by the order the antennas are listed in the chart. That is, for my particular QRP usage, the Buddipole and the Miracle Whip are the best antennas in this lot for my applications, all things being considered.

The idea of looking at and evaluating other antenna characteristics in addition to performance will prepare

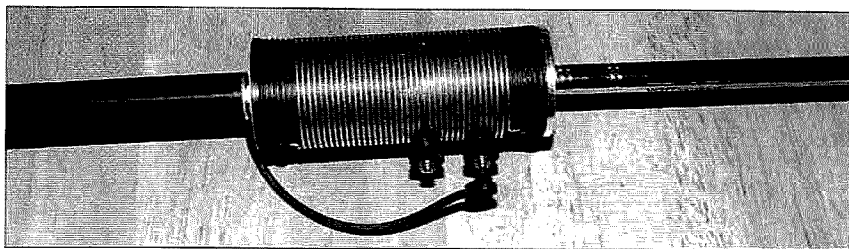


Photo D. The Buddipole's large loading coil.

you for the process of selecting the best antenna for your usage. A QRP/portable antenna's purpose is to get you operating on the air in places where a larger antenna is not practical or feasible. Couple that with the challenge of QRP — that being to operate with low power, not with poorly chosen equipment — and you'll surely understand why all the characteristics of equipment selection must be given proper consideration. Performance and application, together, will yield the best antenna for any QRP/portable activity.

Best of the tests

Individual highlights for each antenna used in this article are:

The Buddipole demonstrated super construction and excellent material selection, all pointing to expected durability in the field. This antenna uses stainless whips instead of the lower-cost, less durable aluminum, a nice complement of brass-threaded fittings and epoxy composite arms add to a

beautifully designed antenna. Configuration versatility is an understatement with the Buddipole. The user can adjust the arms to make a horizontal dipole, centerfed vertical dipole, J-pole, "V" and inverted "V", etc., etc. A light-duty travel case comes with the antenna for transporting around. A standard of quality for all to strive for.

The Miracle Whip offered the widest frequency coverage. The small size of the MW made it a natural for throwing in my briefcase before leaving on a business trip. The designers chose top-notch materials, and used excellent workmanship skills when assembling this antenna. I found that the MW offered excellent performance when used as a short-wave receiving antenna, covering all the HF and VHF ham bands. The fact that you can also transmit on all the same bands was a plus. Note that for transmitting you really need a counterpoise.

The MFJ Super Loop was absolutely

Continued on page 58

Antenna Model	Contact	Freq Coverage	Size		Construction Quality	Ease of			Portability Assembled	Self-Supporting	Performance Merit (0-10, 10 highest)
			Assembled	Disassembled		Set-up	Tear-down	Band Change			
Buddipole	530-226-8446	3	2	3	3	2	3	2	2	0	10
Miracle Whip	866-311-6511	3	3	3	3	3	3	3	3	3	4
MM-20	www.qsradio.com	2	2	3	1	3	3	2	1	3	10
ATX/MFJ	662-323-6551	3	3	3	2	3	3	3	3	3	6
MFJ Loop	662-323-6551	2	1	1	3	2	2	1	2	1	8
Maldol	www.cometantenna.com	3	3	3	3	3	3	Monobander	3	3	2
52Ω realistor	—	3	3	3	3	3	3	3	3	1	0

Key: 3 = Excellent; 2 = OK; 1 = Weak

Table 1. Characteristics of six QRP/portable antennas.

Field Day 2002: Out on Our Own

Can you spell duct tape?

First of all, I should explain that this is a real account of what happened to my friend Tom WB8WIV and me during Field Day 2002. Tom and I have operated Field Day off and on for 25 years now. He lives 4 hours away and we switch off "doing" FD at each other's city almost every year.

Last year, I wanted to participate in the true spirit of Field Day: set up a station in a location not normally used for communications, with minimal preparation of the communications equipment. I wanted to see what we would have to do to put a station on the air using whatever was at hand and to do it all under the (almost) worst conditions. Let me assure you that all the events described below really happened. We were ready at the start of Field Day, made many contacts, and had fun, too!

Saturday morning, 7:00 a.m. local time (1200 UTC)

I fixed a quick breakfast of cold cereal and juice, read the rules for the contest and found out we will be Class 1A. We will transmit with 5 watts of power (QRP-CW), have one transmitter on the air at a time, and use battery power. I figured a random-length dipole fed with 600-ohm ladder line and a tuner would work fine for the HF bands. We will use verticals for 2-meter and 450 SSB if I have time to put them up.

8:00 a.m.

I thought I had better get started on the HF antenna first since it would be

the most useful, so I went out to the garage to look for some wire. Ah, there's some in my junk box on a reel! Now where did I put that ladder line? I looked in a box marked 75-ohm coax and 300-ohm twinlead. Nope, none there! Now, where could I have put it? I looked in the attic — none there either! I went back to the workshop where I keep a few parts and some wire. Aha! There it is, right beside my MFJ mobile tuner, spare speakers, and some other miscellaneous equipment — not where it should have been! I put together the antenna in about 30 minutes using some cable ties and a center insulator. Things are lookin' good! I put some lugs at the tuner end of the feedline and it was ready to go!

8:30 a.m.

Let's see an antenna for 2-meter SSB is next. I'll simply get my 28-year-old Ringo Ranger out from the attic and see how it works. Oh, no! I got it down and began screwing on the coax connector. Houston, we have a problem! The threads on the antenna SO-239 connector are stripped and I can't get the mating PL-259 coax connector on. Okay, it's time for major

surgery on the antenna. I knew that the connector on the antenna would have to come off anyway, so I just attached the coax without any connectors. I stripped back the insulation on some RG-8 foam coax and soldered on some lugs. Then I attached the lugs directly to the ground connection and to the "ring" on the Ranger matching system. Good! That only took a half hour.

9:00 a.m.

Okay, now. On to the 450 MHz vertical! I shouldn't have any problems with that, right? After all, it IS new and has never seen the outdoors. I attached the coax in about 20 seconds! This is the way it's SUPPOSED to work! Okay, what will I use for a support? I went back up to the attic to get a 12-foot piece of pipe. I put the antenna on top of the pipe and grabbed a few open-end wrenches (from my tool rack in the garage) that seemed to be about the right size to fit the nuts on the U-bolt. None of them would fit! One was too large, the next size was too small. Oh, no! The hardware is METRIC! I went back inside to get my metric wrenches. I found the correct size and tightened up the mounting hardware,



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taped the coax to the pipe, and taped the coax fitting to waterproof it. I attached the whole assembly to a nearby rain gutter to complete the installation.

9:30 a.m.

Now I began thinking about how to get power from my car battery to the gazebo in our backyard where the station is to be located. Uh, let's see, it's only about 50 feet, so a length of RG-8 ought to be large enough to carry an Amp or two while running QRP on all bands. There can't be THAT much resistance in a 50-foot run of RG-8. Well, we will just have to see how it works — that's all that is available to get the power to the radios. After all, this IS supposed to be a simulation of an emergency, right?

I put some large solder lugs on both ends of the RG-8 coax and went back inside to look for a barrier strip for the station end so we could attach both rigs to the battery at the same time. (The person who said it pays to have a well-stocked junk box really knew what he was talking about.) I began laying out the power cable from the car to the gazebo. Ouch! I banged my head right into a hanging plant by the gazebo door! Oo-o-o, my head is pounding now! I told myself that I've just gotta keep going and just tough it out! An emergency waits for no one. (I'm exactly what is NOT needed during an emergency: another injured person!) I should have been wearing a hard hat!

10:00 a.m.

Now my thoughts turned to figuring out how to support the center of the HF dipole antenna. I know that I had a few more 12-foot lengths of 1-inch-square aluminum tubing and some long pieces

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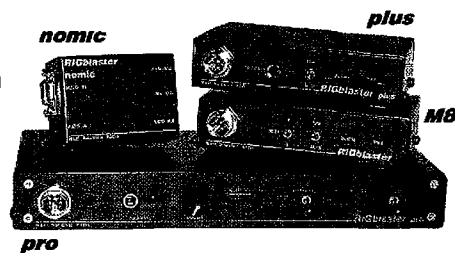
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of wood. I figured a good tall support for the HF dipole could be made by using duct tape to join a length of tubing to each end of a 10-foot piece of wood. I overlapped each end of the wood about 3 feet and taped the junction tightly every 6 inches. That should work nicely! (After all, as all fans of "The Red Green Show" on PBS know, duct tape is the handyman's secret weapon.) That should get the center up around 28 feet and give us a really good signal to the east and west from our QTH in northern Indiana! I attached the dipole and feedline and took the assembly to the backyard to put it in place. Oh no! I found a little present the neighbor's dog left for me. I also left the sprinkler system on so the grass is nice and wet. It's really humid now and the temperature is starting to climb. It's 90 degrees in the shade. It must be Field Day.

10:30 a.m.

Tom called on the phone and said he would be here around 1600 UTC. He said "... I'm bringing my Icom 706 to try out ..." That got me to thinking that his rig may be what saves the day for us since I recalled how my Ten-Tec Jupiter had some problems with very strong signals during a very busy CW contest a few months ago. Strong signals would appear at the

actual transmitted frequency and a few kHz outside the IF filter bandwidth selected. I honestly don't know if that was the fault of the rig or me just learning to operate the radio but I DO remember the problem. The Icom has an analog IF filter (unlike the Jupiter's digital filter) that would probably work better with crowded band conditions. We'll just have to see how the Jupiter works and switch to the Icom if needed.

10:45 a.m.

I just remembered that it nearly always rains at some point during Field Day and that I had not sealed the feedline/wire junction on the HF antenna. So, back down comes the HF dipole. I went inside and borrowed some of my daughter's nail polish to paint over the soldered junction to make it watertight. Thanks, Revlon! (Or whatever brand it was — just as long as it provides a watertight seal at the antenna!)

10:55 a.m.

The HF dipole and UHF and VHF antennas are all up — things are LOOKIN' GOOD! The air temperature in the shade is 90 degrees and the sun is nearly overhead. It's time to take the radios into the gazebo and check

out the operation of all rigs and antennas. I connected the Jupiter HF rig and checked and **DOUBLE CHECKED** the power supply polarity — I didn't want to see any smoke from the rig! (Years ago during one Field Day I actually did reverse the polarity, and thanks to a reverse protection diode we only blew a fuse in an old Ten-Tec. No one ever reverses polarity, do they? Heck, I'm employed professionally in electronics and I couldn't possibly do that — **WRONG!** That's what will happen during an emergency. Thanks to Ten-Tec: They had the foresight to put a little ol' 20 cent diode in there to keep the radio safe and sound.)

12:00 noon

Tom drives up, we have a quick lunch, catch each other up on family and job then decide to go out and have a listen before the flag drops at 1:00 p.m. local time (1700 UTC).

1:00 p.m.

Field Day officially starts for us and we make a bunch of contacts on 40 CW all afternoon.

4:30 p.m.

We're going along fine making contacts, laughing at mistakes we make, nursing down some cold pop and beer, then all of a sudden I hear a slight crash and see the HF dipole lying on the ground! Oh, no: The duct tape ripped! I ran inside and got some hose clamps to take the place of the duct tape. Of course I needed 4 and only had 3. Murphy, are you watching us? Okay, I'll fix you, Mr. Murphy! I went back inside and found two old aluminum C-clamps to take the place of the 4th hose clamp. I tightened them down really tight. They lasted the rest of the contest. Talk about patching things together — it was a classic Rube Goldberg!

5:00 p.m.

We were really taking a beating from the heat and humidity, so my wife suggested that our family and Tom go out for supper. We quickly agreed after racking up a screaming

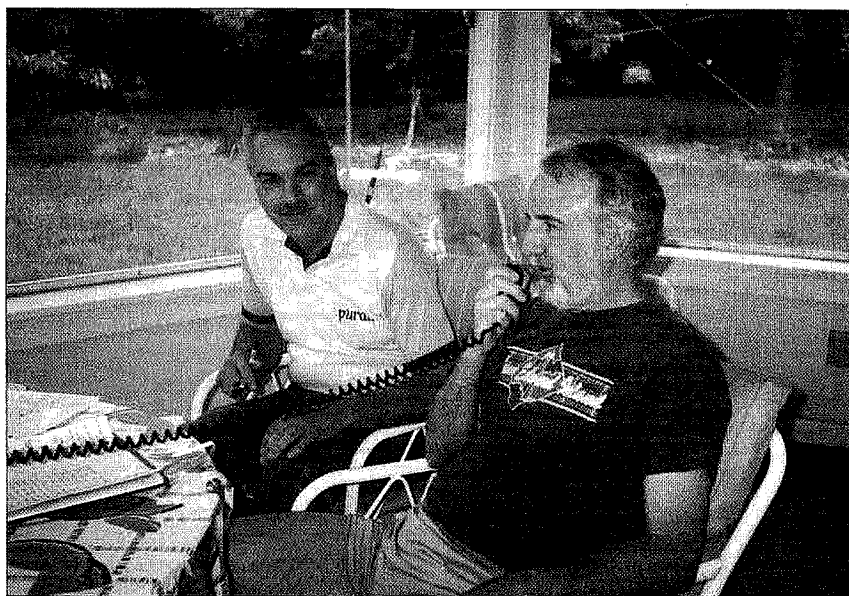


Photo A. Tom WB8WIV logs the calls while Jim WA9PYH handles the mike during their annual Field Day activity.

32 contacts on 40 CW. The air conditioning in the car and restaurant felt so-o-o-o good! Okay, there may not be air conditioning in a real emergency and you probably wouldn't go to a restaurant, but we figured going to one would not give us a big advantage in the contest!

6:30 p.m.

We got back from the restaurant and decided to check the battery voltage. It was 11.6 volts no load and 11.3 volts key-down (5 watts), so I started the car engine to charge the battery. We got back on the air and knocked out a bunch more contacts on 40- and 20-meter CW.

7:00 p.m.

The temperature is still 86 degrees! Even though the gazebo has screens on all sides, I think that some hot air gets trapped inside, making it hotter than outside.

8:00 p.m.

80 degrees and 51 contacts total — we're still having fun but we're really feeling it from the heat. My wife and daughter came out to watch us for a bit and brought us some ice cream. We switched over to the VHF/UHF rig to check the sideband calling frequencies. We worked one local station on each band and that was it for phone. No band openings and no other stations. Back to HF CW.

10:00 p.m.

We both agree it's time to get some sleep. We're not that young anymore. No all-nighters on Field Day like when we were younger!

Sunday 8:00 a.m.

After a good breakfast we went out and hit it really hard, racking up many more contacts on 40- and 20-meter CW. This is REALLY fun!

Sunday 11:00 a.m.


Two hours to go and we've got over 100 contacts. A good night's rest and a good breakfast keeps us going.

Sunday 1:00 p.m.

Field Day is over and we racked up 122 contacts. 120 CW and 2 phone. Then we realized we forgot to copy the *ARRL Field Day Bulletin* for the extra points and never tried CW on VHF and UHF! Oh, well, there's always next year!

We had fun, learned a lot about setting up a station with no preparation and got a few more gray hairs. But we DID have a BALL! I knew we wouldn't place high in the standings but it was so much fun setting up a station and talking to stations using just battery power and a kluged antenna! If you're a ham you already know the excitement of that first contact from a new QTH. Setting up FD on short notice in a new location was nearly as much fun. To hear the transceiver come alive while running on a car battery is really neat when you realize you're all on your own with no commercial power. (We had our own little emergency due to an ice storm this past winter with no power for 5 full days — that's another story, though!).

Oh, yes: It never did rain. (In fact, it didn't rain for many weeks due to an extended drought in the Midwest.) But the HF antenna was ready for it with that nice nail polish. The Ten-Tec performed perfectly even with all those nearby strong signals! The hose clamps and C-clamps on the HF antenna support worked fine, too. The antenna was still up at the end of the contest.

Will we do it again this year? YOU BET! But it's at Tom's this year, so all I have to do is drive up to his QTH and enjoy! But next time I will have a much better appreciation of what can go wrong when you need to put a station on the air in an emergency situation. Like the Boy Scouts say: BE PREPARED! 

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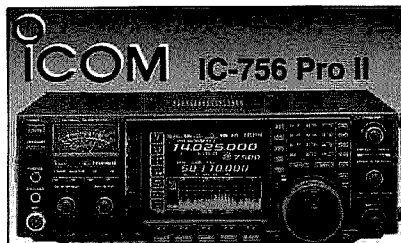
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Now Hear This!

Home-brew yourself a magnetic headphone.

In the past few years, there has been an increased interest in the early days of radio. Periodically you will see articles published on the construction of crystal or regenerative radios. There was even a crystal radio building contest in 2001. I entered the contest, learned a lot and had a blast even though my project did not win. I attempted to make all of the parts for that radio. This is part of that project.

With readily available items from your junk box or hardware store, it is possible to fabricate a functional magnetic headphone that is sensitive enough for crystal (diode) radio operation. This headphone has been used with my crystal radio and performs well; the best part is that it is homemade. If you don't have the exact parts, experiment with what you have, and most of all, have fun; in the process you will learn something that will be useful. The materials and tools used in this project

can be dangerous, so be safe in your work environment and use eye and ear protection.

The nail

The nail is 4" long and 1/8" in diameter; the box was labeled "16d" ("sixteen penny"). The head of the nail is about 1/4" in diameter. Prepare two pieces of wood, one 2" square and one 1.5" square (I used 1/4" oak for sturdiness) and drill holes in the center just slightly smaller than the diameter of

the nail. Hammer the nail completely through the 2" piece until the nail head is flush with the wood surface. Hammer the nail into the 1.5" piece until you have about 2" of spacing between the two pieces of wood. File the nail head until it is smooth and it is about 1.0 mm above the wood surface. You may want to remove the pointed end of the nail; however, this is not necessary.

The wire

The wire used for this project is a

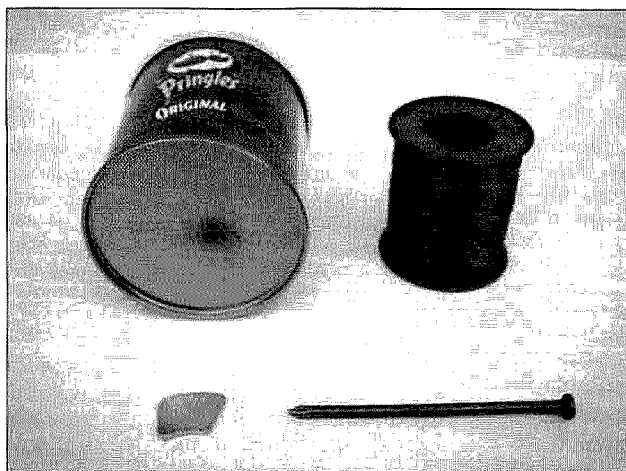


Photo A. Components for headphone.

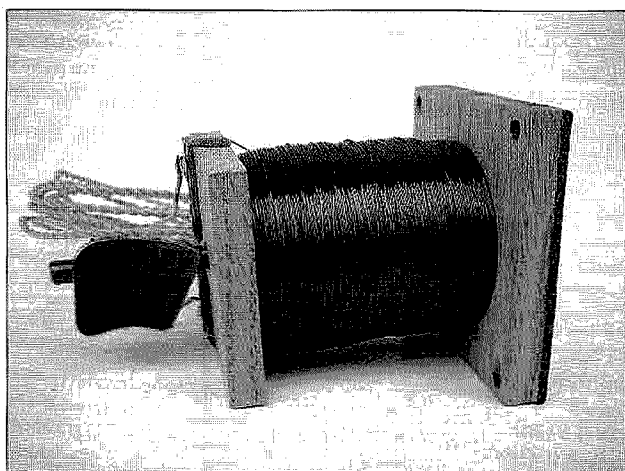


Photo B. Headphone (side view).

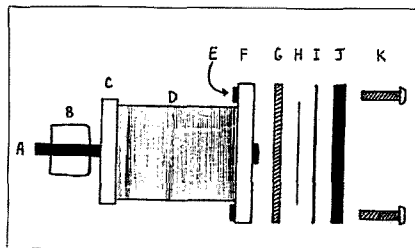


Fig. 1. Magnetic headphone assembly (see Parts list for key).

1/2 pound spool of #32 enameled magnet wire available from Hosfelt Electronics. This is about 2,600 feet and about 430 ohms resistance as described in the wire table from the *ARRL Handbook*. Different diameter wire would probably work, although much smaller than #32 becomes hard to see and to work with. It will take many, many turns to get it all wrapped on the nail. I used my variable speed electric drill with the nail secured in the chuck like it was a drill bit, and the spool of wire on a piece of dowel mounted in a vise. The wire was guided with my fingers as it wrapped on the nail. The process took about 15 minutes. A possible source of wire may be an old transformer.

The magnet

The magnet was salvaged from a junked computer hard drive. There are generally two odd-shaped powerful magnets in hard drives. If you cannot locate any magnets, All Electronics

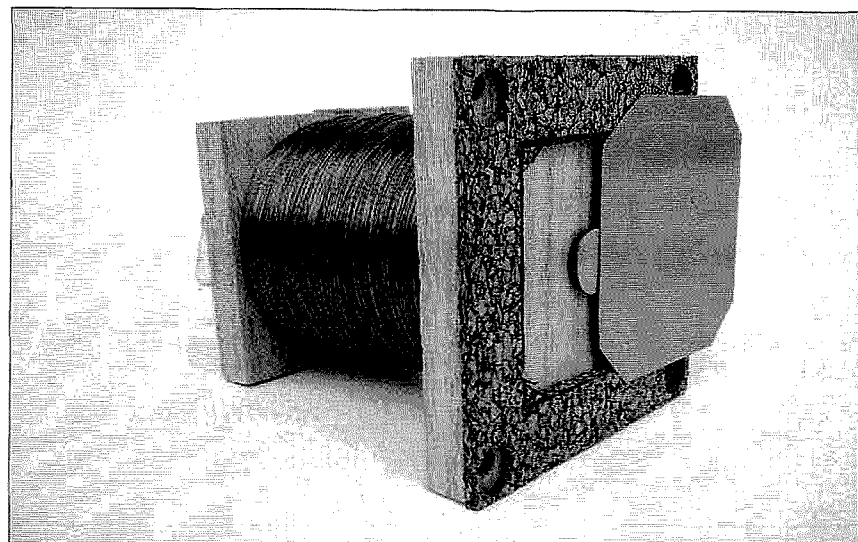


Photo C. Headphone (front view).

sells them. The magnet simply attaches to the part of the nail that extends from the wood. Other types of magnets work, too — it is just nice to find a use for these powerful ones.

The steel diaphragm

Most tin can lids and bottoms have ruffles and ridges. A search in the store found a potato chip canister that has a very nice flat bottom piece roughly .08" thick. Also, frozen juice canisters have flat tops and bottoms. A sturdy pair of utility shears is used to cut the piece to the size you need for the diaphragm. If you want to experiment a little, try using different thickness steel

shim stock. I have tried 0.01" through 0.05" and the best results were with 0.03" and higher. Steel shim stock is inexpensive and can be obtained from an industrial supply company. If the diaphragm is too flexible, it gets pulled into the magnetized nail and you lose the gap between the head of the nail and the diaphragm that is necessary for good performance.

Final assembly

The key to success is the positioning of the diaphragm above the nail head as close as possible without the

Continued on page 59

Fig. 1 Key Letter	Part
A	Nail (16d)
B	Magnet
C	1.5 in. x 1.5 in. wood retainer
D	Wire wrapped around nail
E	4-40 machine nut
F	2 in. x 2 in. wood retainer
G	Cork gasket material
H	Steel diaphragm
I	Cardboard spacer (index card)
J	Cover (aluminum, plastic, or wood)
K	4-40 x 3/4 in. machine screw

Table 1. Parts list.

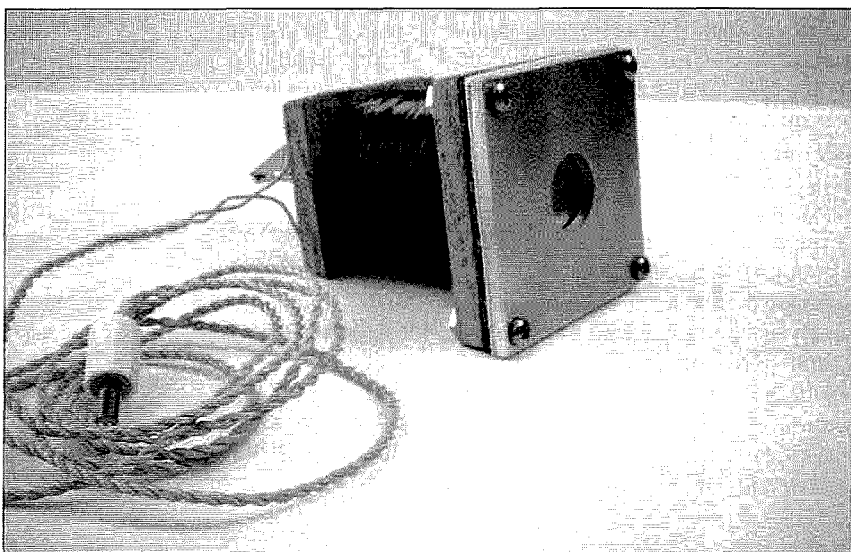


Photo D. Completed headphone.

Yes, I Built Sixteen Log Periodic Antennas!

Part 1: Theory and tests.

The broadband, unidirectional HF log periodic beam antenna was originally developed about 1957 (see references at the end of part 2). Although these very excellent beams are used extensively by commercial, military, and government agencies for both medium and long haul circuits, their use has been rather neglected by amateurs. I have assembled, erected, and tested a number of fixed log periodic wire beams since 1970 with excellent results and would like to pass along some information on these very efficient beams.

I believe that the amateur fraternity may have overlooked or shielded away from these antennas due to:

1) Very little information has been published on HF log periodics in ham publications, although there have been several articles covering these for VHF and UHF. (Listed in a previous LP article in the September 1973 issue of *73 Magazine*, p. 42.)

2) These antennas are quite complex and are highly mathematical. Several pages of formulas, reference to log tables and four or five graphs or monographs are required for optimum design. This information was best presented to the hams in the May 1965 issue of *73*. Although this covered the design of VHF LPs, the formulas also apply to HF.

The antenna manufacturers producing LPs for commercial and military use program this data on a computer. By supplying the frequency range desired, gain required, etc., the computer prints out the element lengths, optimum element spacing, boom length, etc., to provide for maximum forward gain, front-to-back ratio, minimum beamwidth etc.

Although these formulas can be computed manually, several days may be required to design (on paper) an LP having optimum performance in a given space.

3) Most amateurs feel that log periodics are extremely expensive, which they are if purchased. The least expensive rotatable types by one commercial manufacturer are in the \$1500 to \$3000 range for a rotary covering 6 to 30 MHz, capable of 40, 20, 15, and 10m operation. Some of these are used by MARS stations. Rotatable LP ham antennas have recently been announced in the \$300 to \$1000 class.

The larger fixed types for the 2–30 MHz range having

a higher gain are generally in the 10–30 “kilobuck” range. However, by assembling smaller, less complicated wire LPs for the 14–30 MHz range on a “do-it yourself” basis, one having an 8–10 dB forward gain (over a doublet

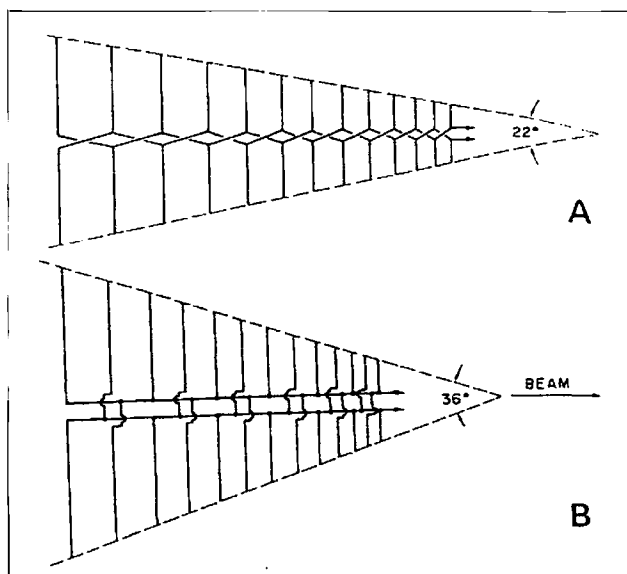


Fig. 1. Doublet log periodic configuration. This will cover a 2:1 bandwidth, say 7–14 MHz or 14–28 MHz. (a) has a 22° aperture angle and gives about 10 dB gain. Note the criss-cross method of transposition of the feeder. (b) is shorter, with a 36° aperture and about 8 dB gain. Note alternate method of transposition of the feeder.

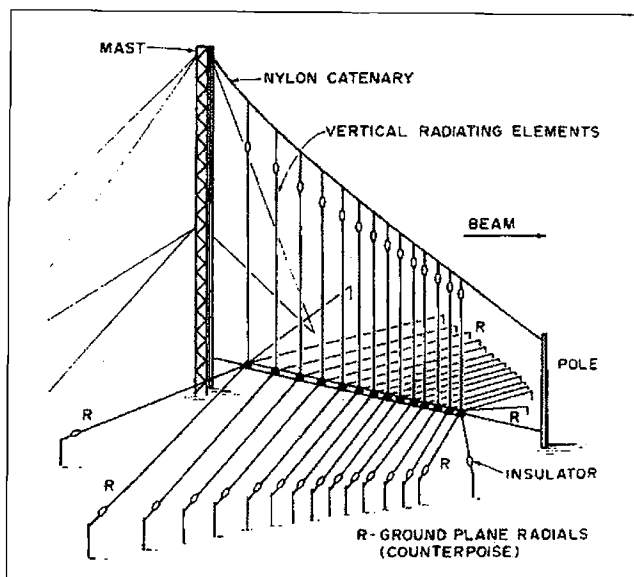


Fig. 2. Vertical monopole log periodic — 2:1 bandwidth.

at the same height) can be assembled for a material cost of \$15 to \$25 not including masts or coax, which will vary depending on the particular site. The largest 17-element 14–30 MHz LP being used here, having a 12–13 dB measured gain, should cost about \$19.50

4) Many amateurs believe a fixed LP requires a great deal of “acreage.” This

is true of the large commercial types having a 10:1 bandwidth or a single beam covering 3 to 30 MHz. These are 63.5–127 meters (250'–500') in length, some even 203 meters (800'). However, a 14–30 MHz LP for 20–15 and 10m having an 8 dB gain can be erected in a space 10.16m (40') wide by 12.7m (50') long. If the length can be extended to 17.78m (70'), the gain can be increased to 10 dB compared with a doublet at the same height. By extending to 25.4m (100'), 12–13 dB can be realized.

Log periodic types

Log periodic antennas can be classified under three general types:

1) The doublet log periodic (DLP) configuration. Fig. 1 illustrates this type covering a 2:1 (plus) bandwidth suited for a ham beam for 7–14.35 or 14–28 MHz.

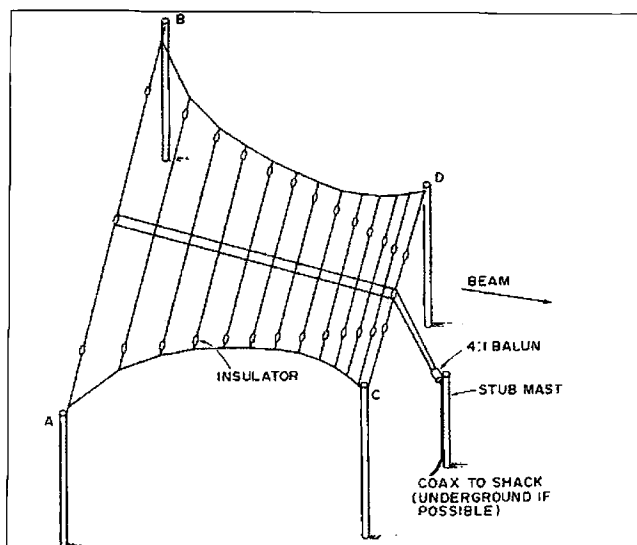


Fig. 4. For method of transposing the center feeder see Fig. 1(b) and Fig. 6. Illustrates the four masts used to support the antennas.

2) The vertical monopole log periodic working against ground or a ground plane counterpoise. Fig. 2 illustrates this type, also covering a 2:1 bandwidth.

3) The trapezoidal zigzag or sawtooth configuration, Fig. 3. This type, being more complicated and not too suited for HF ham applications, will not be covered by this article, which will deal only with the first two types.

Before outlining the construction of the doublet and the monopole types, a brief report will be presented covering the tests conducted here over the past four years.

W4AEO test results on log periodic antennas

During 1970, the first log periodic was put up experimentally here for 20m and 15m only, to be compared with doublets and also a well-known “store bought” trap vertical for 40–20–15 and 10m (using separate radials for each band). The vertical had given fair results for DX, evidently due to its low angle of radiation and its 8.9m (35') height (at the base) above ground.

The first LP was quite simple, using only 7 elements for 20 and 15m and being only 9.7m (38') in length. The back end is supported by the peak of the roof, 10.2m (40') above ground, and the forward end by two cedar trees

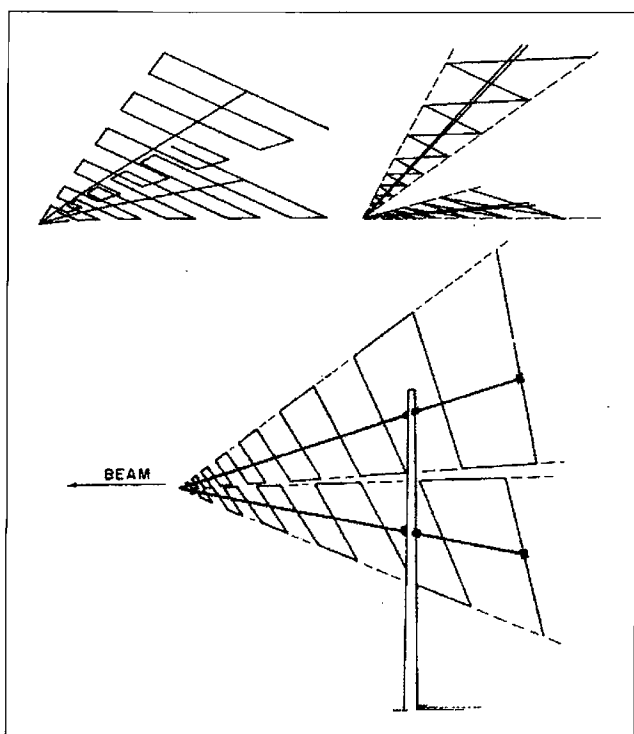


Fig. 3. Trapezoidal log periodics.

SWR Readings			
kHz	LP #1: 7-element 20 & 15	LP #2: 12-element 20-15-10	LP #11: 17-element 20-15-10
14.0	1.1:1	1.4:1	1.4:1
14.1	1.1:1	1.5:1	1.4:1
14.2	1.02:1	1.6:1	1.3:1
14.3	1.02:1	1.7:1	1.2:1
14.35	1.01:1	1.7:1	1.1:1
21.0	1.01:1	1.1:1	1.3:1
21.1	1.01:1	1.2:1	1.15:1
21.2	1.05:1	1.3:1	1.05:1
21.3	1.15:1	1.4:1	1.01:1
21.4	1.25:1	1.4:1	1.02:1
21.45	1.3:1	1.5:1	1.1:1
28.0	*	2.0:1	1.5:1
28.2	*	1.5:1	2.0:1
28.4	*	1.6:1	2.25:1
28.6	*	1.6:1	2.0:1
28.8	*	1.8:1	1.3:1
29.0	*	2.0:1	1.01:1
29.2	*	1.6:1	1.5:1
29.4	*	1.6:1	2.0:1
29.6	*	1.4	2.0:1
29.7	*	1.3	2.7:1
kHz	LP #15: 5-element monopole 80 only	kHz	LP #9: 5-element 40 only
3.5	1.2:1	7.0	1.05:1
3.6	1.2:1	7.1	1.05:1
3.7	1.1:1	7.2	1.01:1
3.8	1.2:1	7.3	1.1:1
3.9	1.4:1	*	*
4.0	1.25:1	*	*
*Not applicable.			
Also see SWR readings for monopole LPs in August 1973 issue of 73, pp. 23-24.			

Table 1. SWR readings.

about 11.4m (45') high. It is beamed south, as I had been working friends in South and Central America also interested in improving beam antennas.

They were capable of making good comparisons with the non-gain antennas previously used.

The results of these first tests amazed me and also the stations being worked. Reports on the non-gain antennas (at the same height as the LP) normally gave reports of S8-9 on 20m from these stations. I used a popular transceiver operated "barefoot." Switching to the LP, these stations would generally report an increase of two S-units, or at least a 10 dB increase over the doublet. Usually, when the doublet was giving S-9, they would give "20 over" on the LP. Although a 20 dB gain would seem exaggerated, the S-meter at this end would generally confirm this increase on their signal when switching to the LP.

It is realized that many S-meters exaggerate, but most are fairly linear and can be used for *relative* comparisons at the lower levels. Further, the S-meter here correlated very closely with the gain figures reported when switching to the experimental LP.

Although the original LP, Fig. 4, would only have a theoretical gain of 8-10 dB, LP gain figures are often based on VHF or UHF models tested over a line-of-sight path. It is noted that one of the large manufacturers of commercial and military HF log periodics (Hy-Gain) rates their 10-12 dB gains "over average soil conditions." It is therefore believed that this first experimental LP gives an honest 8-10 dB gain by averaging the many reports received from various stations to the south over the past 4 years. The S-meter on the receiver here is quite "Scotch." Generally, if a station reports a two S-unit or 12 dB increase when switching from the doublet to the LP, the S-meter here normally shows the same increase in his signal.

Since the original simple 7-element (LP #1) for 20 and 15m was put up in 1970, it has continued to give excellent results and is still being used as of this writing. Several others having more elements and greater length, providing greater gain, have been put up and thoroughly tested. Briefly, these are (in the order tested):

LP #2. 12-element, 17.8m (70') length for 20-15-10m. Now being used for the NE beam for W1s, W2s, and Europe.

LP #3. 12-element, 6.35m (25') length for 15-10-6m.

LP #4. 12-element, 10.16m (40') length for 20-15-10m.

LP #5. #2 tested on edge in the vertical plane or vertically polarized for about two weeks.

LP #6. 13-element, 22.86m (90') length for 40-20-15m. This was a "skip band" type with a portion between the 40 and 20m bands omitted. Two of these are now being assembled for permanent north and south beams.

LP #7. 5-element, 12.7m (50') length for 40m only. (See reference 18.)

LP #8. Two 5-element (same as #7) for 40 only; back-to-back in an inverted vee configuration suspended by a single center support line. One beamed north, one south — exactly 180° difference. Put up to obtain additional and more accurate forward gain and better front-to-back data on 40m.

LP #9. Improved 5-element, 40m only at increased height for additional forward gain data. Aimed south. Gave consistent 10 dB gain over doublet "standard" at same height.

LP #10. 5-element, 10m monoband LP. (See reference 18.)

LP #11. 17-element, 25.4m (100') length for 20-15-10, 15.24m (60') above ground. This is the permanent west beam that has a measured 12-13 dB forward gain to the west. By far the best and highest gain LP installed here to date. Side attenuation is down 25-30 dB.

LP #12. 6-element, 12.7m (50') length. Experimental for 20m only. 10 dB gain. Four additional forward parasitic directors (nondriven) were added later, but little if any increase in gain could be noted.

LP #13. 5-element vertical monopole LP for 40m only, using ground plane radials or counterpoise. Although this LP gave a 10 dB gain, it had an extremely low angle of radiation. Was good for DX, but horizontal doublet type LP #7 or #9 was better for normal operation.

LP #14. Same as #13 except inverted as an "upside-down" inverted ground

LP# & Length	#1: 38' 7 els	#2: 70' 12 els	#4: 40' 12 els	#7: 50' 5 els	#11: 102' 17 els	Exp: 25' 5 els
Bandwidth	14-22 MHz	14-30 MHz	14-30 MHz	40 only	14-30 MHz	20 only
Element	Overall Length (ft.)					
1	36	36	36	70	36	35
2	32	32	32	64	34	33
3	28	29	28	56	31	28
4	24	26	25	49	29	24.5
5	21	22.5	22	40	26.5	20.5
6	18	20	20		24	
7	16	18	17.5		22	
8		16	15.5		21	
9		14	13.5		18.5	
10		12	12		17	
11		11	10.5		16	
12		10	9.5		14.5	
13					13	
14					12	
15					11	
16					10	
17					9.5	
Total wire for els	175	246.5	231.5	279	345	141
Spacing Distance (ft.)						
1	8	10	6	14	14	7
2	7.25	9	5.4	13	10	6.5
3	6.25	8.25	4.5	12	9	6
4	6	7.2	4.25	9	8.5	5
5	5.5	6.9	3.6		7.5	
6	4.25	5.7	3.5		7	
7		5.35	3.2		6.5	
8		4.8	2.8		6	
9		4.3	2.5		5.5	
10		4	2		5	
11		3.4	1.8		4.7	
12					4.2	
13					3.8	
14					3.5	
15					3.3	
16					3.0	
Boom Length	37.25	68.9	39.55	48	101.5	24.5
x2 Feeder Wire Req'd	74.5	137.8	79.1	96	203	49
+ Element Wire	175	246.5	231.5	279	345	141
Total Wire	249.5	384.3	310.6	375	548	190
Apex Angle	29° ($\alpha = 14.5^\circ$)	22° ($\alpha = 11^\circ$)	36° ($\alpha = 18^\circ$)	32° ($\alpha = 16^\circ$)	16° ($\alpha = 8^\circ$)	32° ($\alpha = 16^\circ$)
Approx. Gain	8-10 dB	10 dB	8 dB	10 dB	12-13 dB	10 dB
For Bands	20-15	20-15-10	20-15-10	40 only	20-15-10	20 only

Table 2. Element lengths and element spacing distances.

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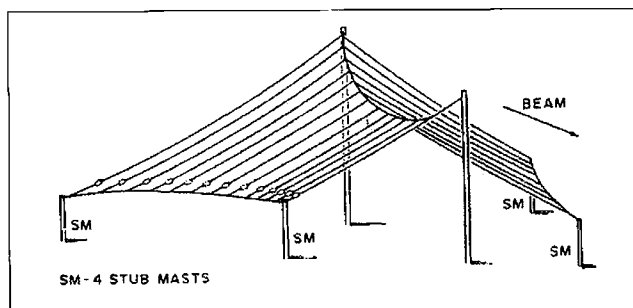


Fig. 5. W4AEO inverted vee log periodic.

plane. Strictly an experimental antenna to try for an even lower angle of radiation.

LP #15. 5-element vertical monopole LP for 80m only. Results similar to 40m monopole, LP #13. Good for DX but poor for close-by stations. Gave 10 dB gain (over 80m doublet at 11.43m, 45°) from stations greater than 1500 miles.

LP #16. Trapezoidal LP for 20 and 15m only, both the zigzag and the sawtooth types tested.

In addition to the above LPs designed and tested here, several other directional antennas were erected for comparison with the LPs. Some of these were:

1) A 6-element, 15m "Long John" yagi mentioned below.

2) A 20m phased beam consisting of two $1/2\lambda$ s in phase, collinear with two collinear reflectors and two collinear directors beamed toward Europe. Although this showed approximately a 10 dB gain, the lobe was much more narrow than the NE LP and the bandwidth

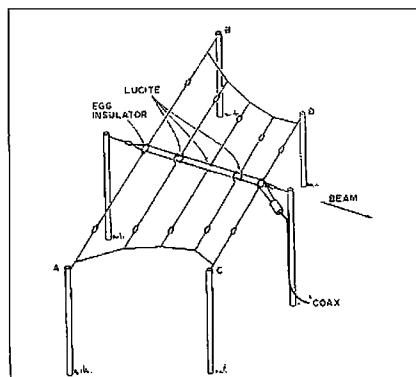


Fig. 6. Five-element monoband log periodic — fine for any band 10 through 80m — see the Aug. and Sept. 1973 issues of 73 Magazine for details.

quite narrow. At ± 50 kHz, the SWR exceeded 1.5:1.

3) A 5-element Bruce array on 20m beamed for Caracas. The gain was lower than any of the LPs tested in that direction; possibly, being vertical, the

angle of radiation may have been too low for this distance. It was only tested a few weeks.

In addition to the ham LPs assembled here, several other LPs have been designed "on paper" for friends and others, one covering 12–24 MHz for several MARS frequencies as well as 20 and 15m. These include several commercial LPs for 3–30 MHz, 2–4, 4–8, 6–12, 8–16 MHz; and several VHF and UHF for 30–50, 140–145, 150–470 MHz, including two for TV: 174–215 and 475–750 MHz. Several have been completely assembled for others on "custom-built" orders.

YV5DLT-W4AEO tests

The most accurate 20 and 15m tests have been made with my long-time friend YV5DLT (ex-W5DLT) of Caracas. We have been constantly testing the LPs for several years. He is able to give very accurate readings on any changes made here.

During the original testing of the first three LPs, schedules were kept daily between 1200 and 1400 local time here as these hours gave the worst case conditions on 20m. Other schedules were kept on 15m.

It was during this period that the 17.78m (70°) LP #2 and the 15 and 10m LP #3 were put up for comparison with the original LP #1, which had performed so well on both 20 and 15m. LP #3 was especially good during the 15m tests, generally showing 5 dB over LP #1 and even slightly better than LP #2; however, #3 was aimed at approximately 165°. Caracas is 149° true, 1854 miles statute. The other two LPs were approximately 180°. All three were about the same height above ground.

After several months of 15m tests on #3, we wished to make a direct comparison with a good yagi aimed in the same direction. I assembled a 6-element "Long John" yagi per reference 20, p. 104. This was erected to the side of LP #3, exactly parallel and aimed in the same direction; both were 11.43m (45°), or about a full wave above ground.

Several weeks were spent comparing these two beams. Invariably, YV5DLT would report LP #3 to be 3–5 dB better than the yagi. The S-meter readings here confirmed this.

40m LP tests

Most of the 40m tests were conducted over a period of several months with old friends W4QS and K4FBU in Florida at the same time daily. During this period, four different 40m LPs were beamed south for Florida at various times for comparison with a good 40m horizontal doublet at 11.43m (45°). One 40m LP #8 was also beamed north for comparisons in that direction. All of these LPs produced 8–10 dB gain in these directions over the dipole; however, many of the tests indicated as much as a 20 dB improvement, which was confirmed by the S-meter at this end and a number of other stations in various parts of Florida.

Since the usual 2-element 40m yagi or two extended $1/2\lambda$ s in phase collinear do not normally exceed 3–4.8 dB gain, the 10 dB average gain of the LPs tested is worth considering — especially because of their low cost and ease of construction.

75 or 80m vertical monopole LP tests

A 5-element vertical monopole, LP #15, was assembled for 75m. Since the mast height limited the longest rear element (the reflector) to 16.51m (65°, $1/4\lambda + 5\%$), this LP was limited to 3.8–4.0 MHz, and all tests were within this range.

It was soon evident that this vertical beam was strictly for longer range communications, due to its lower angle of radiation. The $1/2\lambda$ 80m dipole up 45° (not an inverted vee) used as

the "standard" was better for distances from 400–500 miles. Beyond this range, the vertical LP was better in the forward direction. At night the doublet was better to about 1000 miles; beyond, the monopole LP would show its increase, giving a good gain over its beamwidth.

For ranges greater than 1000 to 1500 miles, the 75m monopole, LP #15, showed at least a 10 dB gain over the dipole. However, for the normal working range on 80m or 75m, the doublet was better for the shorter distances.

A similar test using a 5-element 40m vertical monopole, LP #13, was conducted, with results similar to the 75m test. The horizontal doublet-type 5-element 40m LPs #7, 8, or 9 were better for normal operations, and the vertical monopole for DX. This beam was aimed NW.

During a predawn 40m test with LP #13, a W7 (working a VK on phone) in the NW, about 2,000 miles from here, was monitored. On repeated S-meter readings taken, the monopole was consistently 2 S-units or 12 dB better than on the 40m dipole when receiving the W7 in line with the monopole beam.

Receiving advantages of the log periodic

In addition to the excellent forward gain of the LP which is quite apparent to those being worked, the received gain is also quite noticeable. Another plus factor of the LP is its excellent diversity or "capture" effect during reception.

When QSB is bad on the dipole used as the "standard," switching to the LP reduces fading considerably, since the "readability" on the LP is much better.

Evidently the number of elements and its "boom length" produces the diversity effect due to its size and length compared with the doublet or even a smaller 3- or 4-element beam. The greater the number of elements and the greater its length, the better it performs for reception in addition to the increased gain apparent on both transmission and reception.

For those more acquainted with the yagi, the LP can be considered as a multi-element, unidirectional endfire array having a driven (rear) reflector, a $1/2\lambda$ driven "active" radiator, and a number of forward-driven directors.

LP theory implies that for a given discrete frequency within its bandwidth, 5 elements are generally excited or driven as an "active cell." However, while testing the 17.78m (70'), 12-element LP #2, it was excited with low power on 20m. RF voltage could be detected (using a neon bulb) on *all* elements except the long rear (reflector) element. The second or $1/2\lambda$ driven element (on 20m) was quite "hot" at the ends, as would be expected. The RF voltage on the driven director elements 3, 4–11, and 12 decreased gradually toward the forward end. Some RF could still be detected on the short forward element, 12.

Evidently these multi-element, driven directors add gain and also possibly help lower the angle of radiation in the E

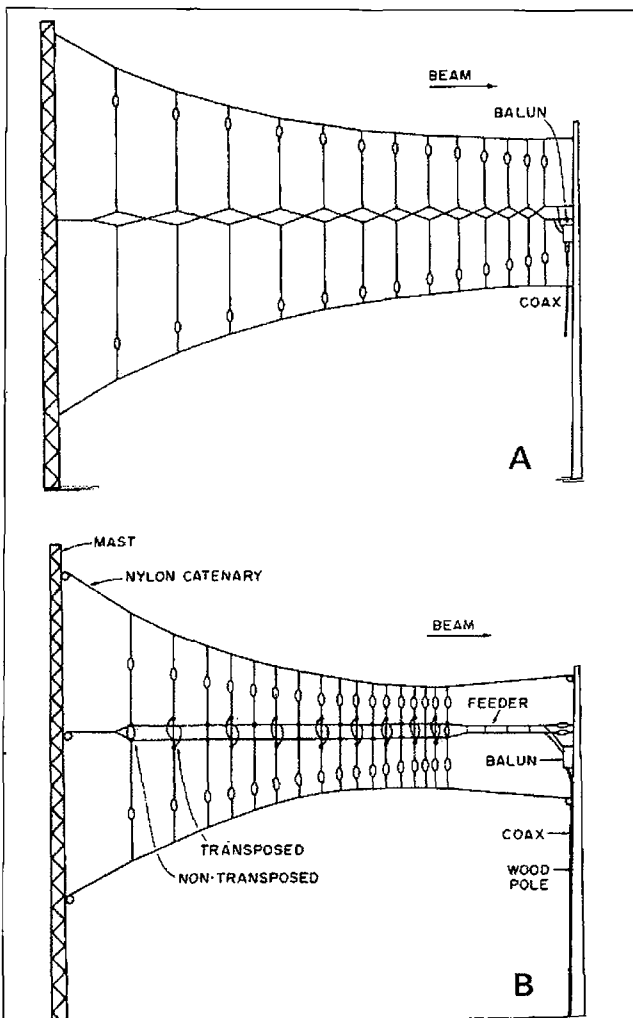


Fig. 7. Vertical dipole log periodic — acreage-saver model.

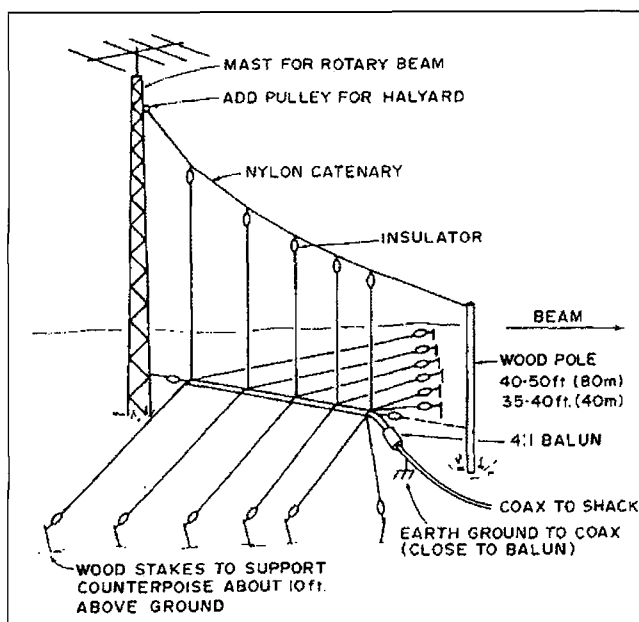


Fig. 8. Single-band vertical monopole — for 40 or 80m. About 10 dB gain.

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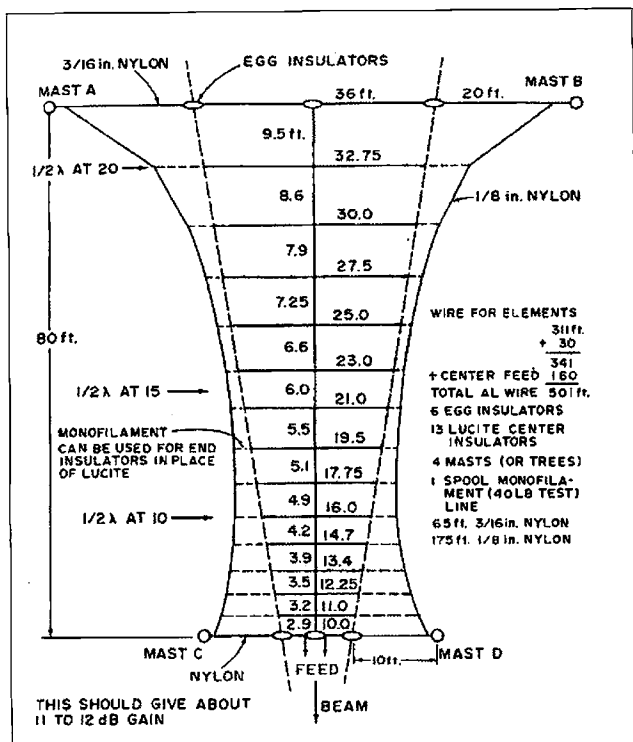


Fig. 9. 15-element 20/15/10m periodic.

Yes, I Built Sixteen Log Periodic Antennas!

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plane and concentrate the forward lobe

The front-to-back or the 40m dipole LPs (DLP) tested appeared to be better for the horizontal than the inverted vee configuration, as would be expected, and the forward gain also better.

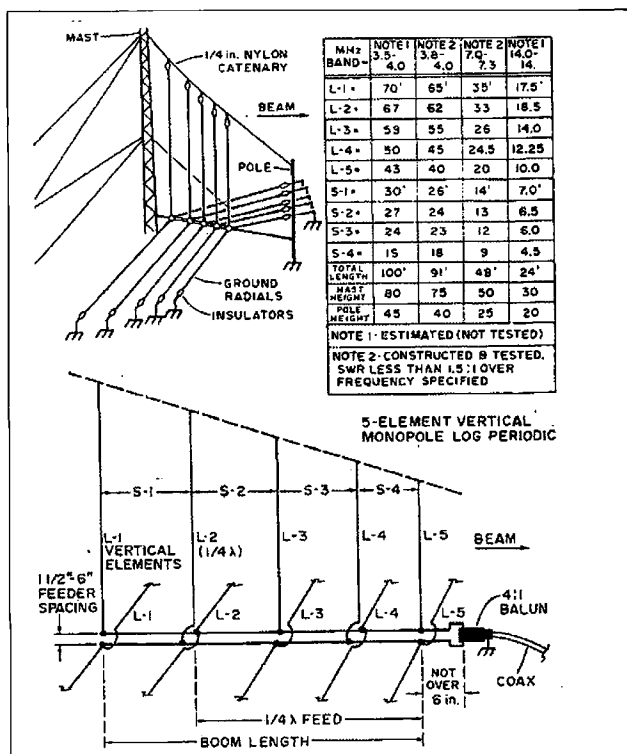


Fig. 10. 5-element vertical monopole log periodic

in the H plane. This may be the reason the apparent gain generally exceeded the theoretical during tests.

Front-to-back ratio

The front-to-back of the LP is generally less than that of a well-designed monoband yagi. The LP seems to be 14-15 dB maximum with 10 to 13 dB as typical. From the tests made here, the front-to-back improves as the LP is raised to at least a $1/2\lambda$ above ground (at its lowest cutoff frequency).

of Australia. The side attenuation of this long LP is down 25-30 dB.

A W1, -2 or -3 could use one or two LPs to cover most of the states. A W6 with an LP beamed east would cover most of the east coast. At this QTH, 4 LPs will cover most continents of interest: NE, Europe; east, Africa (and Australia long path); SE or south, South America; west, Australia; and NW — Alaska, Japan, etc. One for SW may be tried later for long path to Europe.

Fixed beam antennas vs. rotaries

An advantage in using several fixed beams over a single rotary is that they can be switched instantly from one to the other (and to the doublet used as a "standard"), whereas it takes some time for the rotary to swing, making quantitative readings difficult (especially when QSB is bad).

Another item noted during the first year these LP tests were started: About half the stations worked during the winter of '70-'71, using rotaries, would come back, "Sorry OM, I can't swing my beam, it is frozen up for the winter." I noted less of this problem the second winter. Evidently better rotators are being used.

The following comments are comparisons of the LP with several other beams.

The forward lobe

The forward lobe of the LP is generally wider (about 90-100° beam-width) than that of a well designed yagi; however, for a large fixed beam, this is good, as it can be aimed to cover a certain part of the country or a particular DX continent. For example, the NE (LP #2) covers Europe quite well and the 30.48m-long, 17-element west beam (LP #11) seems to cover all

Compared with the yagi

As more hams no doubt use yagis than other beams, these will be compared first. A well designed and properly adjusted 3- or 4-element monoband yagi should give about the same gain as a moderate-size 20-15-10m LP when both are at the same height above ground. The LP will, of course, cover all frequencies 14 and 28 MHz and can be operated with a comparatively flat SWR any place in the three bands. The bandwidth of a high-Q yagi may be limited to a portion of a band as the bandwidth at resonance may be only 2.5%.

Compared with a triband yagi for 20-15-10m, which is generally a compromise antenna, the LP should give the greater gain.

Of all the contacts made while testing these LPs during the past four years, not a single station worked (most using yagis for 20, 15 and 10) had a doublet for use as a "standard" or test antenna for comparison with this beam. Many have been most cooperative in rotating their yagis the full 360° to demonstrate the front-to-back, but none were able to demonstrate its forward gain. The front-to-back on some of the monoband yagis was quite good, while others were very poor.

One MARS station worked had both a rotatable LP and a yagi. He obliged by rotating the LP 360°, which gave a good demonstration of its pattern. When both antennas were beamed in this direction, the LP showed greater gain; however, he did not have specifications on the yagi.

An advantage of having several fixed beams for various directions is that they can be selected instantly by a coax switch or relay. This allows for more accurate data in comparing antennas. Even under fading conditions, a fair comparison can be made by switching rapidly and averaging the readings.

Compared with a rhombic

Anyone having room for a rhombic certainly has room for several LPs for various directions and is then not limited to one direction as with the rhombic.

The TCI engineers (Technology for Communications International of Mountain View CA) advertise their "Extended Aperture" LP, which is only 60.98m (200') in length and has a gain of 17 dBi. A rhombic to produce this gain requires a length of 518.29m x 228.66m (1700' x 750') width according to the TCI ads.

Further, the gain of a rhombic generally decreases at its low frequency end (fewer wavelengths per leg), whereas the gain of the LP is approximately the same over its bandwidth. If anything, at least from the tests here, the LP seems to give slightly better gain at the low frequency cutoff end. The forward lobe of the LP is generally wider than the rhombic, requiring less accurate aiming than the latter.

Compared with phased arrays

To date I have only made comparisons with two phased arrays on 20: a 5-element Bruce and a 6-element collinear array mentioned above, both strictly single band antennas. Neither gave the performance of the LPs. I do plan to test the LP vs. a multi-element Sterba curtain or similar stacked arrays later.

The SWR of log periodics

As a general rule, the SWR of an LP does not exceed 2:1 over the bandwidth for which it is designed, i.e., 14–28 MHz. From the tests here, the SWR over an entire band, 7.0–7.3; 14.0–14.35, or 21.0–21.45 does not exceed 1.5:1. Table 1 gives some of the readings taken from several of the LPs tested. (Also see reference 18 for SWR readings taken on the monoband LPs.)

Log periodic site selection

The first step is to determine if space is available for the LP when beamed in the desired direction. The second step is to decide the desired bandwidth or the bands it must cover and the gain desired. These will, of course, determine the size (length) of the LP and if it will "fit" the space available.

The long rear element (reflector) must be at least 5% longer than the lowest cutoff frequency. The short forward element should be 50% shorter than the high frequency cutoff. The pages of math required for their complete design will not be

presented here. (See references 2, 3 4, 5, 8, 11 and 13.)

To simplify the design and eliminate the formulas entirely, Table 2 presents in tabular form some of the doublet-type LPs (DLP) assembled and tested here for the ham bands as mentioned above. (Dimensions for single band LPs were given by reference 18.)

This tabulation gives frequency bandwidth, element lengths and element spacings, overall (boom) length, apex angle, etc., of each.

Similar information on the vertical monopole LPs for 40m and 80m is supplied by Fig. 10.

If space is available for an LP at your QTH, at least one of these can be tried.

Fig. 4 is a sketch illustrating four masts used to support a typical DLP for 20-15-10m. These masts can be inexpensive 12.20m (40') collapsible guyed TV masts, power poles, towers, trees (as used here), or other supports if available.

Fig. 5 illustrates two high and four stub masts for an inverted V-log-P which I call my "λ-log-P" configuration.

Fig. 6 illustrates a simple 5-element monoband LP that requires the least space. This is especially adapted for 40m. (See reference 18 for complete information.)

Fig. 7 illustrates an "acreage-saver," using a DLP on edge in the vertical plane. This only requires one high and one lower mast and little width.

Continued on page 59

Amplifiers, ATU Down Converters & Hard to Find Parts

<h3 style="text-align: center; margin: 0;">LINEAR AMPLIFIERS</h3> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>HF Amplifiers PC board and complete parts list for HF amplifiers described in the Motorola Application Notes and Engineering Bulletins:</p> <table border="0" style="width: 100%;"> <tr> <td>AN7941 (20W)</td> <td>AN758 (30W)</td> </tr> <tr> <td>AN7941 (20W)</td> <td>AR313 (300W)</td> </tr> <tr> <td>AN762 (140W)</td> <td>EB27A (300W)</td> </tr> <tr> <td>EB63 (140W)</td> <td>EB104 (600W)</td> </tr> <tr> <td>AR305 (300W)</td> <td>AR347 (1000W)</td> </tr> </table> </div> <div style="width: 45%;"> <p>2 Meter Amplifiers (144-148 MHz) (Kit or Wired and Tested)</p> <table border="0" style="width: 100%;"> <tr> <td>35W - Model 335A</td> <td>\$79.95/\$109.95</td> </tr> <tr> <td>75W - Model 875A</td> <td>\$119.95/\$159.95</td> </tr> </table> </div> </div>	AN7941 (20W)	AN758 (30W)	AN7941 (20W)	AR313 (300W)	AN762 (140W)	EB27A (300W)	EB63 (140W)	EB104 (600W)	AR305 (300W)	AR347 (1000W)	35W - Model 335A	\$79.95/\$109.95	75W - Model 875A	\$119.95/\$159.95	<h3 style="text-align: center; margin: 0;">HARD TO FIND PARTS</h3> <ul style="list-style-type: none"> • RF Power Transistors • Broadband HF Transformers • Chip Caps - Kemet/ATC • Metallized Mica Caps - Lineco/Somco • ARCO/SPRAGUE Trimmer Capacitors <p>We can get you virtually any RF transistor! Call us for "strange" hard to find parts!</p> <p>DIGITAL FREQUENCY READOUT For older analog transceivers TK-1 (Wired and Tested) \$149.95</p>
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Conspiracy?

When I claim that the AMA and the medical industry seem to be colluding to hide the fact that any illness can be cured without the need of any drugs, some people put me down as another conspiracy wacko. Never mind the common sense of what I've been writing. And never mind the damning statement of the AMA's chief counsel.

See for yourself at [<http://educate-yourself.org/fc/drugstory.shtml>].

What you'll find is that the Rockefeller interests, starting back in 1910, have gained tight control of the major drug companies, our major newspapers, the radio and TV networks, the AP, and even the Fed, which issues of our money.

The drug industry is particularly choice because it produces such incredible profits.

Please download the story so you'll see how you and your family have been had big-time.

College, My 2020 Vision

With the best brains in the world in any field as advisers and professional actors as teachers available inexpensively via interactive DVD educational programs, a university campus will have to provide more than lectures and endless tests of short-term memory ... which have been the core product supplied by colleges and universities for over a century.

The students of 2020 are going to be able to pursue knowledge anywhere in the world their DVD player and Internet connections can take them. Unless a university is able to provide hardware beyond that available via computer simulation, it may be difficult to attract students.

Reviving 78s

One of the personal computer pioneers, George Morrow, after the crash of Morrow Computers, retired with his collection of thousands of old

78 records in Hillsborough, CA. He was going to apply some computer magic and make the old 20s and 30s jazz music available again on CDs. His approach was to digitize three of the old records and let his computer select each byte where two were identical, thus cutting out most of the record's surface noise.

Next, by comparing second and third harmonics of bass notes cut off in the vinyl recording process, he was going to enhance the bass.

When I sold out my computer magazines, I lost track of George, and recent letters haven't been answered. But he sure had a great idea. Someone should do it.

I remembered this while listening to a local radio station playing 1920s records.

When I get some time, I'd like to make some of my 78 collection available over the Internet. It's out in the barn and should be preserved. No, I don't have three of every record like George. But songs like "Life Gets Tejus, Don't It" ought to be available again. And Rosalie Allen singing, "Can't You Take It Back and Change It For A Girl."

Oh, by the way, about how many minutes a day are you spending sitting down, relaxing, and listening to music? How many times do I have to nag you about the importance of de-stressing your body with good music? For me there's nothing more relaxing ... and exciting, in a way ... than leaning back in an easy chair and listening to Wagner's *Rienze Overture* or Franck's *Symphony in D Minor*. Ahhh, nirvana!

New World Order?

Another militia-type rumor arrived from one of my readers. He'd heard from a "reliable source" that Gunderson Steel, in Washington, has made 140,000 railroad boxcars for the government, each fitted with 143 sets of handcuffs. That's handcuffs for 20 million people.

Well, killing 20 million people actually did happen in

Russia under Stalin, and in China under Mao, so it's not without precedent. Hitler came close. But, presuming that these boxcars can be used more than once, maybe we're talking about handling 100 million or even 200 million Americans. Hey, that's everyone except the guards and train crews.

What a crock.

First of all, (1) our country isn't worth much without people. We're the golden goose — 99% or more don't know what's going on and don't want to know. The few that do don't know what to do about it. Secondly, (2) killing off 20 million people, unless you use bioweapons or nukes, is a major undertaking. Hitler's helpers managed to kill off about 12 million people, but it took them quite a while. By the time you jam 143 people into a boxcar all you'd have to do is lock the doors. The handcuffs wouldn't make much difference.

If you're not going to kill them, (3) you'll need massive toilet facilities and an awful lot of food and water — plus a lot of trustworthy guards. (4) Where in the country could they hide 140,000 boxcars? At 20 per acre they would fill 7,000 acres. (5) And how about the hundreds of engines and train crews needed to move boxcars full of screaming people around? (6) All this would take a lot of fuel, which means that all of the businesses involved in getting fuel to the railroads would have to be left in place — all the way back to the oil wells in Saudi Arabia.

Crock.

I'm a lot more worried about the pole shift Nostradamus and a bunch of others have predicted than the New World Order.

Amelia

Reader Schmeusser was kind enough to send me a newspaper clipping about two groups heading for the Pacific to look for signs that Amelia Earhart crashed either on Nikumaroro or somewhere near Howland Island.

Well, unless the natives in the Marshall Islands, where I spent a couple of submarine rest camp vacations on Majuro in 1944, were lying, she and Fred Noonan crash-landed in the Marshalls in 1937. Then, they said that the Japanese navy came a few days later and picked up Amelia, Fred, and their plane and took them to Saipan.

When we stopped off to refuel at Saipan the natives there confirmed that Amelia, Fred and their plane had been brought there. They said that Fred had been injured in the crash and died, but that Amelia was held there until just before the Americans came and took the island.

It's interesting that Fred Goerner got the same story from the natives at Majuro and Saipan when he visited the islands many years later. It's interesting too that our navy did everything it could to keep Goerner from visiting these islands. It's quite a story. Look it up in your library.

My interest, for newer readers, is that Amelia was a good friend of my dad's. She had dinner with us several times, and she kept her Lockheed at my dad's airport.

Shortly before her 1937 flight, Bob Wemple, her chief mechanic, visited us for dinner and said he'd been working on her Electra, installing larger engines, extra wing tanks, and cameras. He said that the whole purpose of the around-the-world flight was so she could over fly the Japanese navy installation at Truk and get photos for our navy. President Roosevelt, previously the Secretary of the Navy, had asked her to do it. They knew the Japanese were doing something important there, and wanted to know what.

The higher-powered engines, Bob said, were so she would be able to fly from Lea, New Guinea, to Howland Island via Truk in the same time that her regular engines would have taken.

Only she missed Howland.

If you look at a map of the Pacific you'll see that her only practical choice was to either fly west to the Gilbert

Islands or northwest to the Marshalls. The Gilberts, being few and far between, were not a good choice. So I wasn't surprised when the Majuro natives said she'd flown to the Marshalls. It all made good sense.

Amelia, clearly being a spy, was captured by the Japanese and eventually executed.

Our government has been covering all this up because it was embarrassing that the most famous woman in the world had been made a spy and therefore was legally executed.

But, after over 60 years, perhaps it's time to come clean.

The Liar

President Clinton set a new low in presidents. He was a liar. Over and over he was a liar: when he said he hadn't perjured himself; did not conceal evidence; did not conspire to intimidate witnesses; that all these things were just personal mistakes; that the raw files on 900 Republicans was not for the purposes of blackmail; that those files came to the White House by mistake; that Hillary did not benefit from the guaranteed commodities trading transactions; that this was not a bribe; that he did not receive millions of campaign dollars from China; that he did not personally intervene to aid the transfer of military technology to China (to use against the U.S.); that these two actions were not connected. Well, you can add to the list for me.

Competition

Barnum was sure right about suckers, only he vastly underestimated the sucker population. Politicians, who are experts in sucker manipulation, have been taking advantage of people's gullibility for thousands of years.

Case in point is the golden glow of price controls. Whee, those greedy businessmen are going to be forced to sell us something at a lower price than competition dictates. Never mind that in all of history

price controls have never worked. And that includes rent controls.

The recent power shortages were caused mainly by price controls. Nixon made everyone feel good with price controls. But not for long. The price-controlled stuff quickly disappeared from the market, replaced by "new" models, which were not price-controlled, and cost a lot more.

The more that the government meddles with markets, the more they mess them up. Rent controls have resulted in millions of buildings being destroyed. Drive the Cross-Bronx Expressway sometime to get the picture.

Competition brings us the best products at the lowest prices. Don't mess with it.

Then, along come monopolies, which give us bad products at high prices. Like the post office. Monopolies stifle innovation and defraud the customer.

Look at what happened to telephones when the government broke up the Bell monopoly. Before that we had very little choice of instruments. There were no cell phones, no answering machines, touchtone "dialing," wireless phones, and so on. Bell minions installed every phone and we weren't permitted to mess with the wires. We couldn't attach anything to their wires. We couldn't buy the phone instruments, we had to rent them from Bell. And ask any old-timer about long distance rates! We didn't make long distance calls unless it was an emergency, and then we went to the nearest Western Union or Postal Telegraph office and sent a wire. A ten-word wire that was delivered by boys on bicycles.

Have rent controls helped low income families? Surveys have shown that they're quickly taken over by higher-income families, who pay the lower-income families a premium price to move.

Another beautiful example of a monopoly providing bad products at premium prices is our public school system. Our kids are forced by law to

attend these government institutions. In NYC's inner-city schools the schools spend \$8,000 a year per student, and half of the students never make it to graduation. Parochial schools in the same areas spend about \$3,500 and nearly all graduate and most go on to college.

Look at the AMA's medical monopoly. We have, as a result, the most expensive so-called health care in the world and, according to the Department of Health, less than 2% of us are truly healthy.

Wow, are we suckers to put up with this baloney!

Then there's our post office with its government-guaranteed monopoly. While the prices on everything else have been dropping, we've just had another postal increase. If you could get your congressman to have the guts to get rid of that monopoly we'd see the cost of sending letters dropping. Sure, we might have to standardize envelope sizes and print the labels on our computer printer to get the 10-cent price.

Meanwhile, more and more of us are using E-mail.

What's It Take?

The Medical Mafia is at it again! According to *USA Today*, schools and courts are putting pressure on parents to drug their children with Ritalin or have them taken away from them under charges of child neglect. All it takes is for school officials to diagnose a child as suffering from "attention deficit hyperactivity disorder" (ADHD). And never mind the causes ... such as boredom with the unchallenging schoolwork. Or, far more likely, being fed a high-sugar breakfast of sugar-coated cold cereal or pop tarts.

And also never mind that all of the anti-depression drugs such as Ritalin, Prozac, Zoloft, Paxil, and so on have well-documented histories of causing manic behavior. Every one of the school shootings has involved kids on these drugs, usually forced on them by the school authorities.

There doesn't seem to be

any movement to educate school shrinks and social workers on the subject. These people pay no price for being wrong, so they've no interest in educating themselves. It's just the kids and the parents who have to pay the price for this drug madness.

Genetic Engineering

The usual shrill, uneducated, but vocal groups are crying out against the rash of genetic engineered foods that are being produced. The Europeans, particularly, are very upset over Frankenfoods.

It's interesting that the first independent, non-industry-sponsored study of the effect of these foods on animals was made public three years ago. Arpad Pusztai, the researcher at Rowett Research in Aberdeen, Scotland, reported his findings on British TV.

He reported that rats fed gene-modified potatoes had substantial organ damage, a thickening of the small intestine, and poor brain development. The result was a public furor.

Rowett's director, Philip James, quickly fired Pusztai, said the research didn't exist, broke up his research team, seized the data, and stopped six other similar projects. It then came out that Monsanto, a leading U.S. biotech firm, had given Rowett Institute a \$224,000 grant.

Lancet, the British medical journal, published Pusztai's peer-reviewed paper supporting the research.

What about the FDA? What do you think? Their stated view is that biotech-engineered foods are about the same as any other foods and thus are not required to be tested before being put on the market.

The biotech firms are doing everything they can to make sure Congress doesn't require biotech engineered foods to be labeled as such.

Not that people who are buying stuff from the giant food companies can avoid

Continued on page 33

Travels with Henryk — Part 13

Borneo hams strut their stuff.

Borneo is one of the largest islands located on the Equator in Southeast Asia. The island is shared among Malaysia, the Sultanate of Brunei, and Indonesia. The Malaysian part is called East Malaysia and consists of two states: Sarawak (9M8) and Sabah (9M6). A few islands off the coast of Sabah count as the Spratly Islands, and the prefix 9MØ is used there.

I arrived in Sabah by air to Kota Kinabalu. The city has grown immensely since it was totally destroyed during WWII. This area was called British Borneo until the '60s, and the city was called Jesselton then. At the airport I was met by Doris 9W6DU and Alfons 9M6MU (**Photo A**). We drove almost 100 miles to Hillview Gardens, a hotel combined with an amateur radio club.

Next morning, I met Ralph DK3GH (**Photo B**), who was revisiting Hillview Gardens. I stayed in a small bungalow (**Photo C**) surrounded by antenna towers. The radio room is in the main building now, but initially it was in this bungalow. There are a few operating positions for HF and one for 50 MHz. They even have a 50 MHz beacon. The main station consists of a modern Icom transceiver and a medium-

power linear amplifier (**Photo D**). Exactly how many antennas there are is hard to tell (**Photo E**). The main tower carries large arrays for the 40- and 20-meter bands (**Photo F**), as well as a 2m FM repeater antenna. A good Internet connection is available, and the club has an informative Web site at [www.qsl.net/9m6aac].

Another visitor arrived at 9M6AAC a few days later. Barry VK2BJ came



Photo A. Doris 9W6DU and Alfons 9M6MU at the Kota Kinabalu airport.

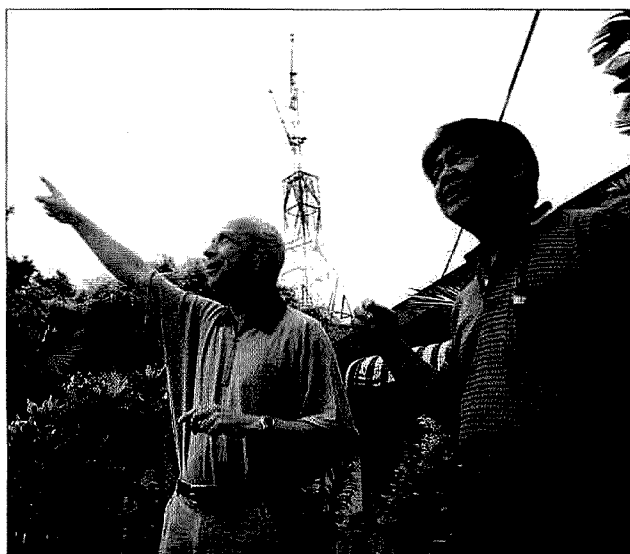


Photo B. Ralph DK3GH and Alfons 9M6MU at Hillview Gardens.

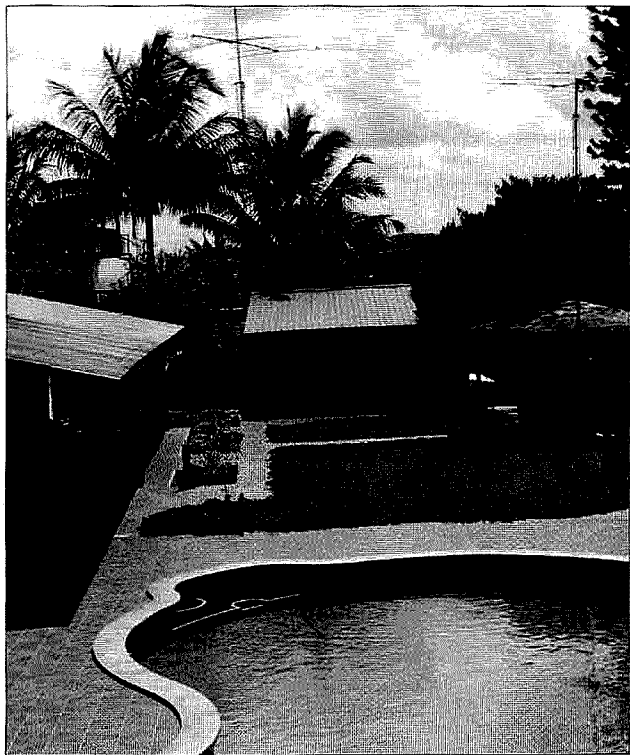


Photo C. A few antennas are visible in this view of the 9M6AAC club station at Hillview Gardens.



Photo D. Doris 9W6DU at the 9M6AAC microphone.

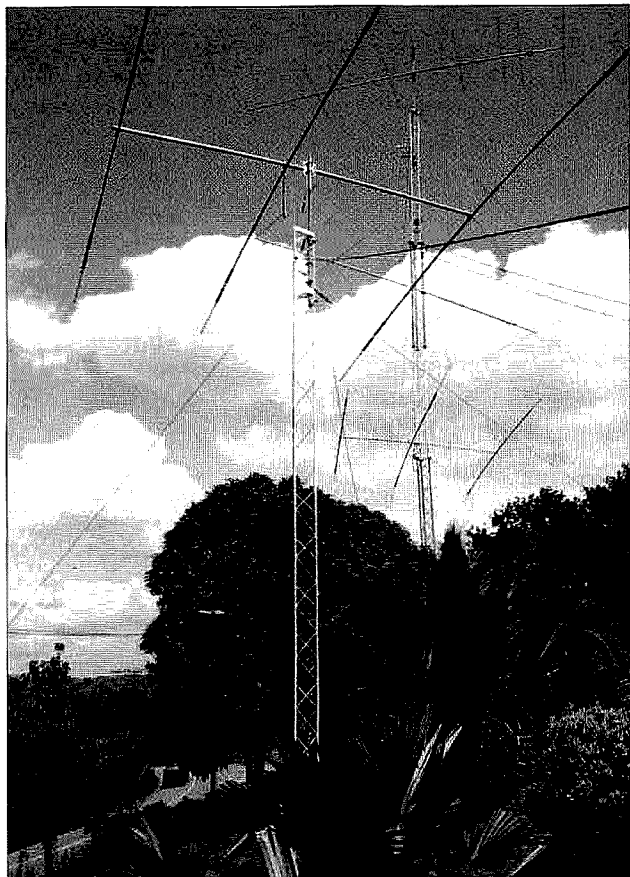


Photo E. More antennas of 9M6AAC.

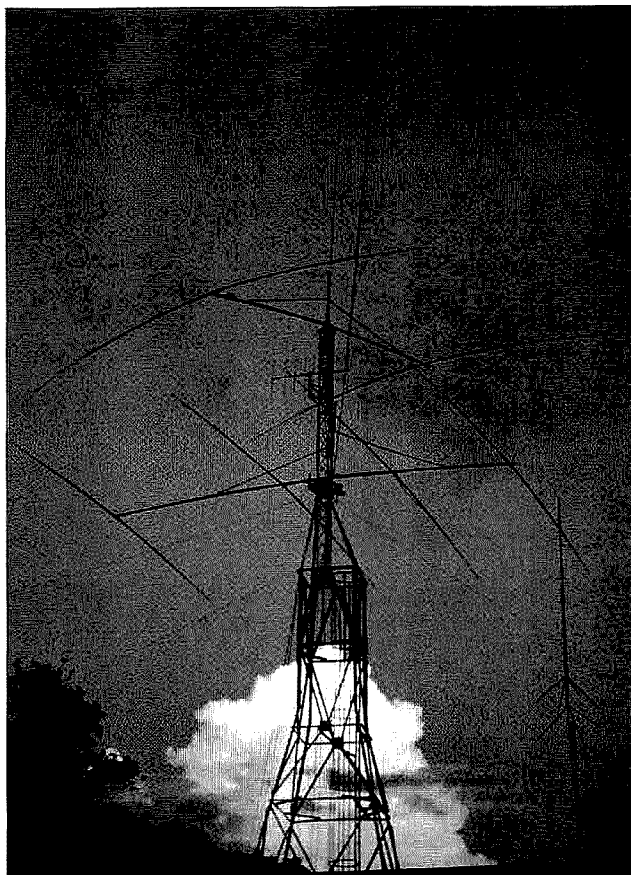


Photo F. The main tower of the 9M6AAC club station.



Photo G. Alfons checking E-mail while Barry VK2BJ looks on.

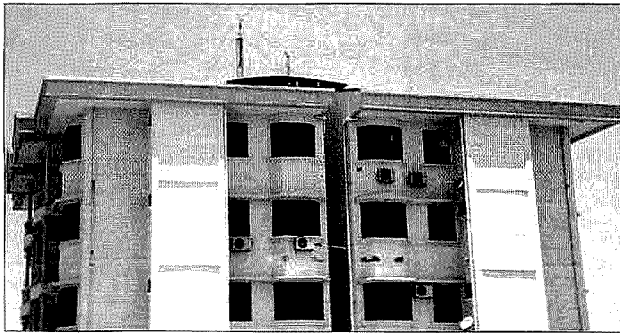


Photo I. QTH and antenna of Phil 9M6CT.



Photo J. Butternut vertical attracts snakes at 9M6AAC. (A different kind of tuning loop?)



Photo H. After the contest, Barry VK2BJ gets a relaxing massage at the local beauty parlor.

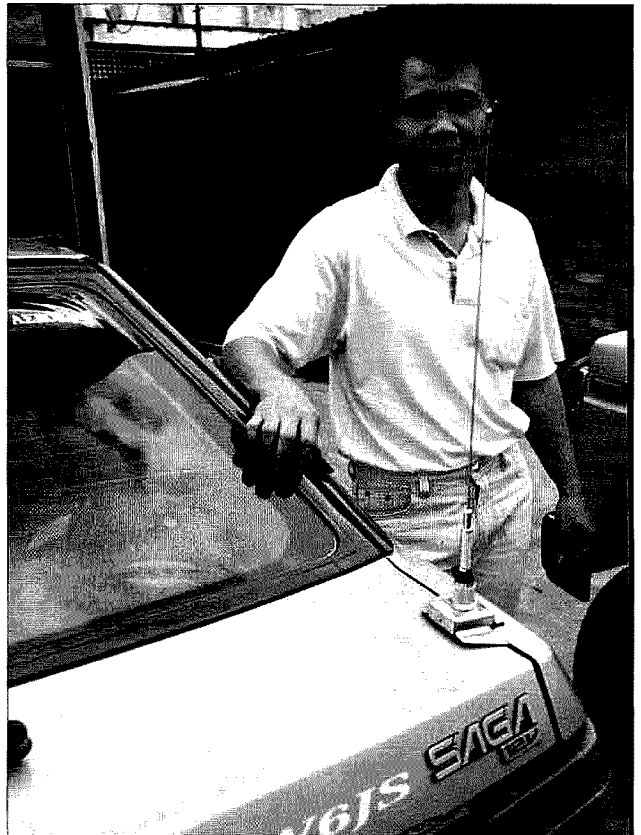


Photo K. Another ham from Keningau — John 9W6JS.

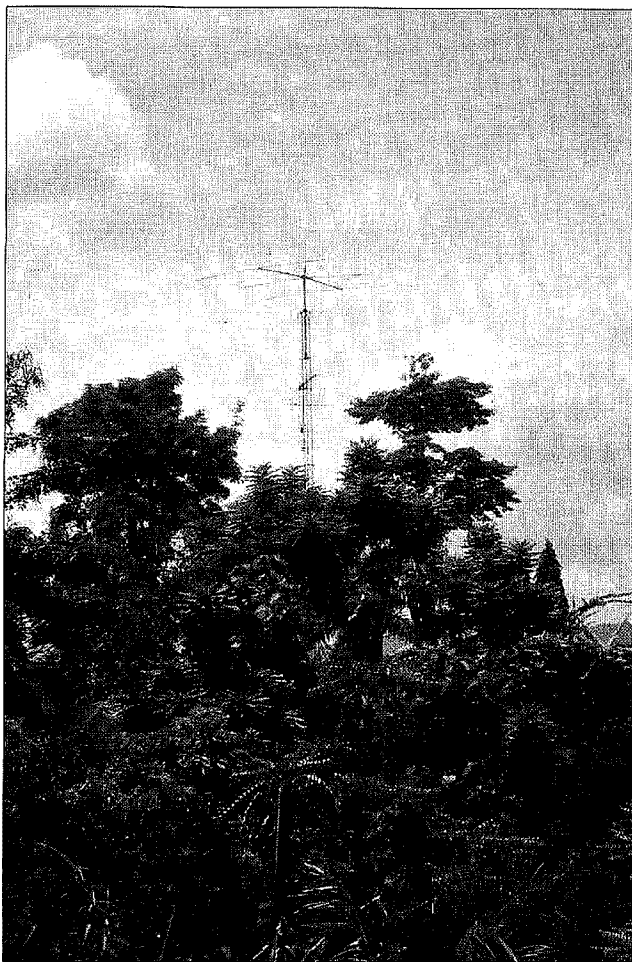


Photo L. Antenna of Dr. Elvin 9M6EL.

here from Sydney, Australia, mainly for the Commonwealth Contest. When the contest was over, he E-mailed the logs to the QSL Manager Bob N2OO and the contest sponsor (**Photo G**). They have good facilities in Borneo and a good massage is available after a contest. I went to downtown Keningau, the nearest town to Hillview Gardens, with Barry, and he was treated to a relaxing half an hour in a beauty parlor (**Photo H**). The Hillview Gardens club is obviously very often on the air. Apart from paying guests there are a few local operators. Yani YBØUS from Jakarta looks after the antennas and the equipment, and of course spends much time on the air, sometimes as 9M6US. Phil 9M6CT, who moved from Hong Kong where he was VS6CT for years, is here. He now lives in Kota Kinabalu (**Photo I**) and often drops in to Hillview Gardens. There are other visitors, not so much welcome, like snakes that get tangled up in some antennas (**Photo J**).

The number of amateur radio operators is growing in Sabah. While we were looking for a component, Alfons 9M6MU introduced me to John 9W6JS (**Photo K**) in Keningau. Another active ham in this area is Elvin 9M6EL, who has a tall antenna tower on the outskirts of the town (**Photo L**).

There have been hundreds of amateur radio visitors from all over the world at Hillview Gardens and 9M6AAC since the grand opening in 1997. The Hillview Gardens club is a joint project with many people involved. Most of the equipment has been donated by individuals and companies. I strongly recommend visiting this place if you want to experience both exotic environment and equatorial propagation — not to mention the great hospitality of Doris and Alfons.

In Nov. 2001, the annual SEANET Convention took place in Sabah in cooperation with the Hillview Gardens ARC. **73**

NEUER SAY DIE

continued from page 29

genetically engineered ingredients, since 70% of our processed food now uses 'em.

Housing Shortage

Proof #2,726,975 that the government makes a mess of everything it does is the housing shortage (translated: incredibly high home prices and rents) in San Mateo. The recent census showed that the housing supply there has grown half as fast as the population. Big surprise? Sure, with over two-thirds of the county off-limits for building anything. Naturally the "concerned citizens" are in favor of preserving both "open spaces" and "affordable housing."

We have the same kind of stupidity concentrated in state legislatures all around the country ... including a deadly concentration somewhere near Baltimore.

Open space preservation plus building

height limits guarantee that more and more people will have to commute to work from an hour or so away. And we wonder about road rage on California's clogged freeways ... and their high traffic death toll.

The recent electric blackouts have almost caused some of the vigorous opponents to the building of generating plants in general, and nuclear plants in particular, to start thinking. Almost. No, hey, let's just put a ceiling on the electricity prices by law ... that'll keep prices low. It will also keep the supply low.

Well, if the electric companies can't supply low-cost electricity when they're not permitted to build new generating plants, let's have the government take them over. Yep, that's what we're hearing from environmental activists and some movie stars.

Why am I reminded of New York City's 34th Street convention center? Donald Trump offered to build it for \$200 million, and to absorb any cost overruns. The city turned him down and

did it themselves. The total cost was over \$1 billion, and they forgot to build any parking space for visitors.

Then there's the billions in cost overruns on Boston's Big Dig, which are so astronomical that all anyone can do is laugh.

If Congress would remove the Post Office's monopoly on mail, experts have estimated that privatization would lower postal costs by at least 50%, and more likely 70%. If you want something done over budget, over schedule, and poorly, let the government do it. A visit to Russia gets that message home in a hurry.

Lying?

If you're interested in the Flight 800 crash, check [http://worldnetdaily.com/news/article.asp?ARTICLE_id=26266], wherein someone on the deck of a Navy submarine very close to the crash site saw TWA 800 shot down.

Continued on page 62

Reverse Breakdown Voltage Measurement Adapter

Build this simple project for your bench.

The circuit shown in Fig. 1 is the schematic for a Reverse Breakdown Voltage Measurement Adapter. Many times it is necessary to determine the breakdown voltage of a semiconductor. A reverse-biased P-N junction conducts current when its reverse breakdown voltage is exceeded. For a regular diode, this is the same as the peak inverse voltage (PIV).

Bipolar junction transistor reverse breakdown voltages can also be measured with this device. Furthermore, a zener diode's breakdown voltage can be measured. If the current through the device under test (DUT) is limited during reverse bias, the junction voltage drop remains relatively constant.

This design will test zener diodes from 5.1 V to 75 V. A multimeter set on DC volts is plugged into the unit along with the DUT.

Reverse breakdown voltage is read directly from the meter. When testing reverse bias diodes, a display of 5.1 V denotes a 5.1 V zener diode. Similarly, a display of 75 V represents a 75 V zener diode. When measuring these voltages, remember that the diodes usually have a $\pm 5\%$ or $\pm 10\%$ tolerance.

The zener diode voltage is dependent on the current through the device. The reverse breakdown voltage measurement adapter described here has a short-circuit test current of approximately

10 mA. If the rated operating current of the zener is greater than 10 mA, the measured zener voltage will be incorrect.

Description

The reverse breakdown voltage

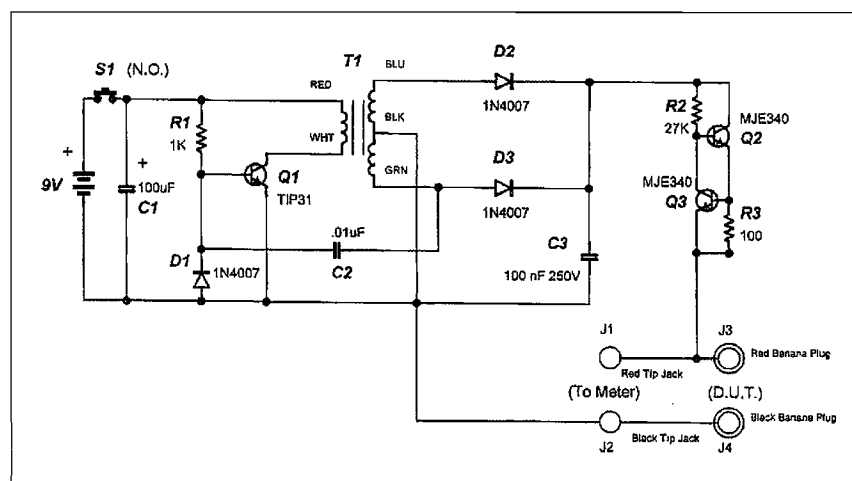


Fig. 1. Schematic of a Reverse Breakdown Voltage Measurement Adapter.

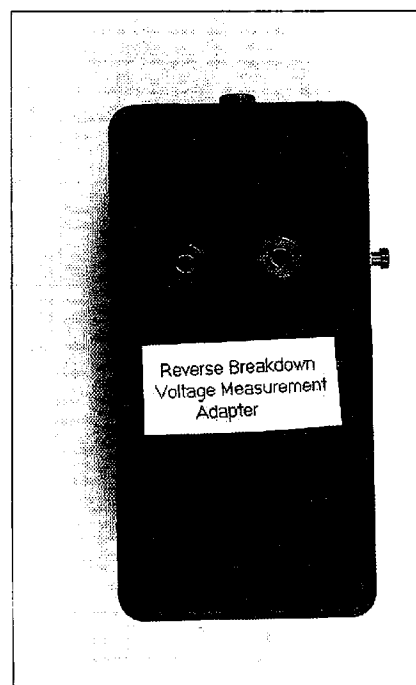


Photo A. Front view.

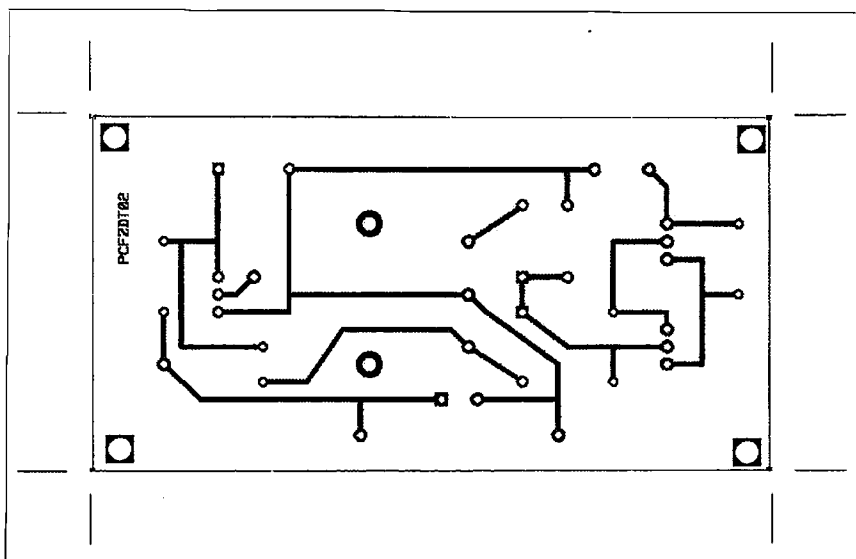


Fig. 2. 1x PCB artwork.

measurement adapter is composed of two basic parts. The first is a +125 VDC power supply. The second is a 10 mA current source that is connected

from the +125 V to the DUT. The other terminal of the DUT is connected to ground. T1 is a 1k to 8 ohm audio transformer. This transformer is used

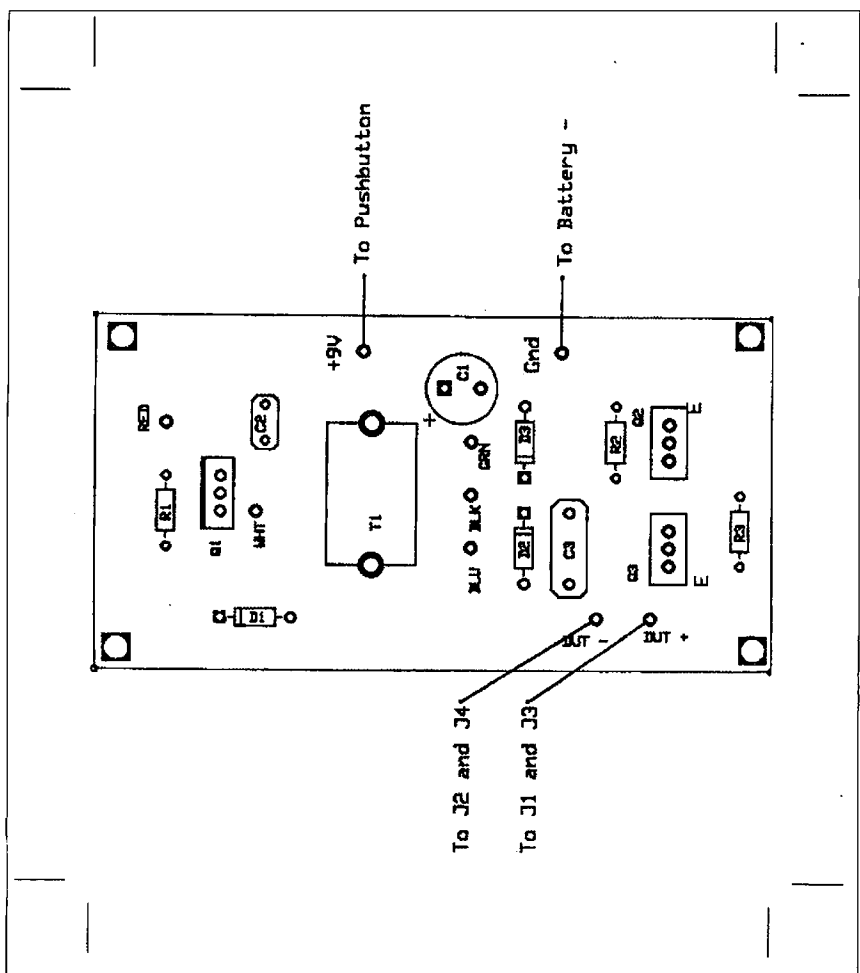


Fig. 3. Component placement diagram.

in reverse (the 8 ohm winding drives the 1k winding instead of vice versa).

This allows T1 to generate +125 V at its 1k to center-tap winding. This center tap is connected to ground. The voltage at the green wire of T1 is 180 degrees out of phase with the red to white winding. The feedback drives the base of Q1 through C2. Q1 provides an additional 180 degrees of phase shift, causing a 360 degrees total phase shift along with a loop gain greater than 1.

This results in sustained oscillation (with some clipping). R1 is necessary to start the oscillator. D1 protects the base of Q1 from negative high voltages. D2 and D3 form a full-wave rectifier with

Part	Description	P/N
R1	1k 1/4W 5%	
R2	27k 1/4W 5%	
R3	100Ω 1/4W 5%	
C1	100μF 35V electrolytic	
C2	10nF	
C3	100nF 250V film	
Q1	TIP31	
Q2, Q3	MJE340	Mouser 511-MJE340
D1, D2, D3	1N4007	
T1	Audio transformer 1k CT to 8Ω	Radio Shack 273-1380
S1	N.O. push-button	
Case		Radio Shack 270-1803
Red tip jack		Mouser 530-105-0802-1
Black tip jack		Mouser 530-105-0803-1
Red banana jack		
Black banana jack		
9V battery holder		
9V battery clip		
9V battery		
2-sided adhesive tape		
Hookup wire		
Black test cable	Black banana plug to alligator clip cable	
Red test cable	Red banana plug to alligator clip cable	

Table 1. Parts list.

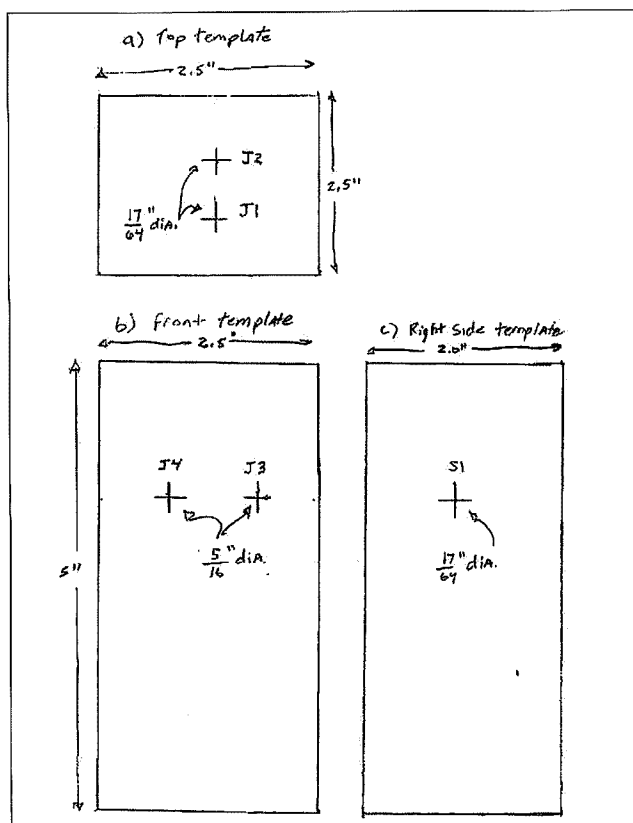


Fig. 4. Drill template: (a) top template, (b) front template, (c) right side template.

reference to T1's center tap. The output voltage of D2 and D3 is filtered by C3. Q2, Q3, R2, and R3 form a current source with a short circuit current of 10 mA. The current source allows the testing of reverse breakdown voltages without having to constantly change a series resistance for a given test current.

Construction

Fig. 2 shows the 1x printed circuit

board (PCB) artwork for the tester. Component placement is given in Fig. 3. Part values are referenced in Table 1. First, install the resistors and diodes in the PCB. Then mount the capacitors and transistors. Note that Q2 and Q3 are facing opposite directions. For proper mounting, examine the pin designations of the MJE340 in Fig. 5 and the emitter (E) marking in the component placement diagram in Fig. 3. After Q2 and Q3 are installed, mount the transformer to the circuit board by inserting T1's

mounting tabs into the PCB and then bending them at right angles. Pads on the PCB are marked RED, WHT, BLU, BLK, and GRN (refer to Fig. 3). T1's color coded wires are soldered to each corresponding solder pad.

Obtain a 1x copy of the drill templates shown in Fig. 4. Cut them out and tape to the case. Next, mark the location of the holes with a punch. Remove the patterns and then drill the

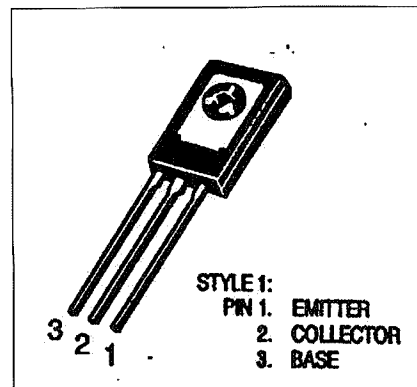


Fig. 5. Transistor designations.

holes in the case as shown in Fig. 4. Solder six inches of red wire to J1 and six inches of black wire to J2. Then, mount these connectors in the appropriate holes in the case. Mount J3 and J4 to their holes in the lid. Examine Fig. 3 for the connections of the test jacks. Solder the red wire attached to J1 to J3.

Next, J3 is connected to the DUT + pad with a six-inch piece of hookup wire. Solder the black wire attached to J2 to J4. J4 is then connected to the DUT (-) pad of the circuit board with another short piece of wire. The +9 V pad is soldered to one terminal of the push-button switch S1, and the other terminal of the switch goes to the red wire of the 9 V battery snap. The black wire of the battery snap is attached to the GND pad of the circuit board. Finally, mount S1 to the case. The 9 V battery holder is attached to the reverse side of the lid near the lower part of the case with two-sided adhesive tape. Snap on the

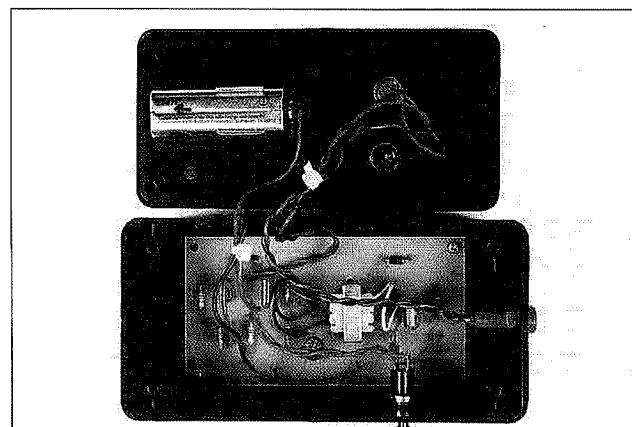


Photo B. Inside view.

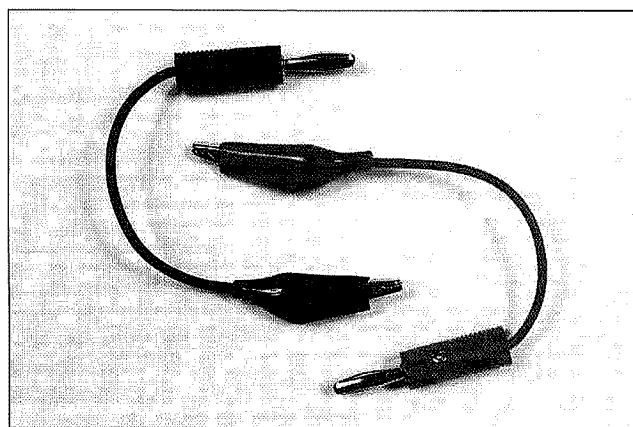


Photo C. Test leads.

battery connector and install the battery into its holder.

Testing

To improve safety, it is suggested that a resistor of 1 megohm be placed across capacitor C3 to function as a bleeder.

To test the circuit, attach a voltmeter across capacitor C3 and press S1. The meter should read approximately +125 V. If there is no voltage across C3, verify the correct attachment of T1's color-coded wires to their respective circuit board pads.

Also, check the correct installation of Q1 and D1.

Note: Because transformer color coding varies by manufacturer, proper phasing may be achieved by reversing a pair of colored leads, e.g., RED-WHT or BLU-GRN.

Once C1 has a charge of +125 V, the current source can be tested. Plug a voltmeter into J1 and J2.

To connect the DUT to the reverse breakdown voltage measurement adapter, either purchase or construct two test leads. One test lead has a red banana plug and alligator clip, while the other test lead has a black banana plug and alligator clip. Insert the red banana plug into J3 and insert the black banana plug into J4. Clip a 1k resistor between the alligator clips. After S1 is pressed, the meter should read between 8 V and 10 V.

This voltage drop corresponds to a current of 8 to 10 mA, thus verifying the operation of the current source. If the voltage drop is too high or is zero, there may be a problem with the correct installation of Q2, Q3, R2, and R3. Once the adapter is operational, mount the circuit board to the inside of the case using small self-tapping screws. Then attach the lid with the four screws provided with the case.

Operation

Set the multimeter to read DC volts. Verify that the meter is plugged into the tip jacks, J1 and J2. Be sure that the banana plugs with alligator clips attached are plugged into J3 and J4.

To measure the breakdown voltage for a zener diode, attach the red alligator

clip to the cathode (black band of the diode) and connect the black alligator clip to the anode.

Then press S1 and observe the meter. The zener voltage can be read directly from the meter. If the meter reads +125 V, then the reverse bias voltage is greater than this instrument can measure. This may occur if the DUT is not an actual zener diode, but a regular diode with a peak inverse voltage (PIV) greater than +125 V.

The unit will also measure forward voltage drops for any diode. In this case, the red clip is attached to the anode of the DUT and the black clip is attached to the cathode (black band). Pressing S1 will send 10 mA through the DUT, and the meter will show the forward bias voltage drop for the diode being tested.

This device can also be used to determine various properties of bipolar junction transistors (BJTs).

For NPN transistors, use the following instructions to measure the reverse breakdown voltages. In order to read the collector-emitter breakdown voltage (V_{ceo}), clip the red test lead to the collector and the black test lead to the emitter of the BJT. When S1 is pressed, the collector-emitter breakdown voltage will be displayed.

To measure the emitter-base breakdown voltage (V_{ebo}), clip the red lead to the emitter and the black lead to the base. Press S1 and read the result from the meter.

The collector-base breakdown voltage (V_{cbo}) can also be measured by connecting the red lead to the collector and the black lead to the base. Next,

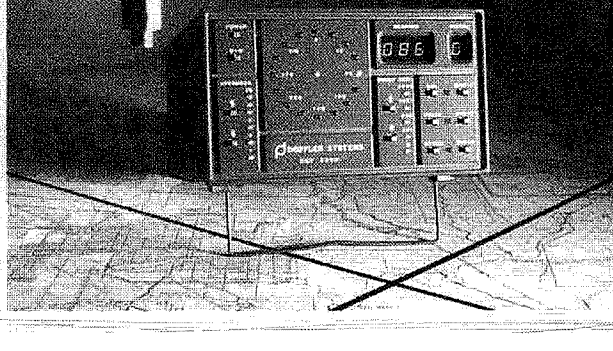
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press S1 and examine the meter for the result. To determine the breakdown voltages for PNP transistors, measure similarly to the NPN transistors, except switch the polarity of the test leads.

Remember, the circuit can only measure reverse breakdown voltages of +125 V or less. Have fun building and operating the reverse breakdown voltage measurement adapter! 

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BASIC AWARD — 100 COUNTRIES WORKED

1. W1RFW	57. N6IV	117. IK1IYU	177. N7CNH	237. OZ9BX	297. N0IDT
2. WB2DIN	58. KN8D	118. N6GCN	178. PY3IO	238. KB4HBH	298. KA1FUE
3. KT1A	59. KC5YQ	119. KB1AF	179. YB0ZCA	239. KA3RWP	299. KD7EO
4. W3FDU	60. WB6ITM	120. KB8BHE	180. YB0AF	240. NJ1T	300. JH8MWW
5. KA9JOL	61. KA2AOT	121. KE2CG	181. VE3PQB	241. W4DCG	301. KB8ICD
6. WB1BVQ	62. K4LHH	122. VS6CT	182. W2SV	242. YC0RX	302. JA1CIE
7. NW7O	63. VE2QO	123. G3IZQ/W	183. N1ADE	243. VE7OJ	303. N3GEE
8. AK4H	64. KE5AT	124. WB6FNI	184. WP4AFA	244. AA4W	304. JA5MG
9. W3HCW	65. W9SU	125. KA01AR	185. KS7V	245. N9GMM	305. KA1FTU
10. KZ2W	66. W3OOU	126. K9SM	186. W2OFB	246. KB4HBH	306. WA8KMK
11. K9FD	67. NR2E	127. W6BCQ	187. G4ASL	247. KM4HF	307. N2IBW
12. WD5N	68. KF5PE	128. KA5MSL	188. N5JUW	248. CE1YI	308. N4THE
13. KA9TNZ	69. N31BN	129. WB4FLB	189. KA8WAS	249. KA1FVY	309. N3CYD
14. K9GBN	70. KB4SJD	130. N7GLT	190. 5N0WRE	250. N2GVH	310. JA4TF
15. N5GAP	71. N3FZX	131. WA0X	191. AA4IP	251. N2DAO	311. W6YLL
16. WB3FMA	72. IK8GCS	132. KF4GW	192. JR5KDR	252. WF8E	312. WA1S
17. NN6E	73. WB4I	133. N4QGH	193. KD2WQ	253. YB0HZL	313. KC5WA
18. AL7HG	74. NGIS	134. VE1CBK	194. KA3NIL	254. N5MBD	314. N6WK
19. N6CGB	75. WB7UE	135. 7J1AAL	195. WA8YWK	255. N4SNS	315. PY4OY
20. KI6AN	76. HK4EB	136. K6ICS	196. VE1ACK	256. KA3TGY	316. KG7BO
21. K9JPI	77. K0BFR	137. NZ7W	197. HP2XVB	257. JN3XLY	317. WB3FQY
22. N4WF	78. N7GMT (KF7SH)	138. WB0N	198. WB5KYK	258. N4DUV	318. WC0A
23. K6PKO	79. AA4VN	139. WC7F	199. N5JUI	259. KA9MRU	319. VE4AMU
24. KW7J	80. KA1LMR	140. F6IFE	200. N4OBJ	260. KA4OTB	320. YC0MCA
25. VE6JO	81. N8AXA	141. KL7N	201. 9Q5NW	261. N4IED	321. WA3LEU
26. WA4IUV	82. NM2I	142. KE8LM	202. KW2D	262. AB4KA	322. KB2GLO
27. W4ZFE	83. KD9YB	143. WA6YOO	203. VE1HA	263. WA7OET	323. OZ1FNX
28. N4KMY	84. HC2CG	144. VE2MFD	204. HP8BSZ	264. KA3RVH	324. K6GCF
29. W0HBI	85. VE1BXI	145. N3APQ	205. IK8IJQ	265. CE7ZK	325. KC4PCX
30. K8KJN	86. YC2OK	146. HK1DBO	206. YC3DKN	266. NI9J	326. KA7EXD
31. KG1V	87. N4GNL	147. NM3V	207. I3VKW	267. WB9PTN	327. DK9EA
32. K1KOB	88. GM3UBF	148. IK6GPF	208. K2EWA	268. KB8DAE	328. HL5AP
33. KY3F	89. SZ4BP	149. WB6UAN/M	209. KD3CR	269. W0CL	329. SM7BRO
34. PY2IY	90. I0AOF	150. NK6Z	210. N9GIG	270. WB7VUB	330. ON6DP
35. YB5BEE	91. VE1BN	151. KB6IUA	211. KF8K	271. JF6TUU	331. WA3KKO
36. YB5BEH	92. KA2NRR	152. W9OKH	212. FD1BEG	272. ZY3IO	332. KB9ABI
37. WB9SBO	93. SZ4DU	153. WB5FXT	213. DU1DZA	273. KB4VIR	333. DA2UI
38. N0AFW	94. KB8ZM	154. NB3E	214. N8IMZ	274. OE6CLD	334. SM0BNK
39. KA9MOM	95. HK4CCW	155. N2ESP	215. KK4YA	275. N7JQU/DU3	335. WA2BMQ
40. N3II	96. W2JQ	156. YU2EII	216. LU1JDI	276. KK4FB	336. WA0QIT
41. W6DPD	97. HC2AGT	157. OZ1DXX	217. KA8YYZ	277. DU1AUJ	337. SZ4BH
42. KE8GG	98. WD5N/M	158. IK5IUI	218. KA4TMJ	278. K2EWB	338. KB9ALG
43. VE6VK	99. VE1BHR	159. KA1ION	219. WA9DDC	279. NI5D	339. OA4ANR
44. KD9RD	100. VE1AGZ	160. KD3AI	220. Y1ICIS	280. N2JXC	340. OD5ZZ
45. W4WJJ	101. K5AOB	161. OK1AEH	221. YC3FNI	281. N0IWT	341. VE3ZD
46. K0HSC	102. K9L2D	162. W9LCR	222. G0FWG	282. WB3BDH	342. LU2ATR
47. KI6GI	103. PY3ARZ	163. 8P6SH	223. KV4B	283. K1CVF	343. HL5FRG
48. IK1APP	104. WB4ETD	164. KA6SPQ	224. N5IET	284. KA3CXG	344. UB5LRS
49. KJ4RR	105. N2FPB	165. ZF2KH	225. WA9WIG	285. KA1SPO	345. N1ICC
50. K8MDU	106. KD3CQ	166. W6MIV	226. N3CDA	286. WA4NWT	346. UY5XE
51. N1EIU	107. K4NNK	167. JA8CAQ	227. KE6KT	287. KJ4OI	347. PS7AB
52. K1DRN	108. VU2DNR	168. K16WF	228. IK7DBB	288. KA3UNQ	348. IK4NPC
53. WD8REC	109. AA5BE	169. K2MRB	229. JY5EC	289. WB2VMV	349. KD1CT
54. ZL2BLC	110. PY3OG	170. AA6GM	230. N1ETT	290. KD4MM	350. DU1CHD
55. VE3EFX	111. VF4ACF	171. JA0SU	231. PY2DBU	291. OE3DHS	351. U84WZA
56. W9MCJ	112. VE4SI	172. NU8Z	232. I8IYW	292. KD9HT	352. LU3CF
	113. PJ2KI	173. G0GRK	233. N0ISI	293. DL8OBC	353. G7AZP
	114. WB4CKY	174. YB8VM	234. KC4BEB	294. G3KVA	354. VE5AAD
	115. W6EQB	175. DV1BRM	235. WA7QQI	295. WA4NEL	355. IK3ITX
	116. KK4IY	176. W0TU	236. KA1RJG	296. KA4VZO	356. SM4SEF

357. N9CPK
358. VE2JWK
359. N7JXS
360. K04VO
361. JE1GWO
362. JM2DRM
363. IK1SLE
364. JF7QUE
365. HL5BUV
366. VE3GLX
367. N7QXQ
368. JE6KLR
369. KK6JY
370. N2BI
371. KK4XL
372. JA3SSB
373. KBØADI
374. 1I-50156
375. VU2SMN
376. EA6AAK
377. N3IHS
378. NMOT
379. KB2NEK
380. PY2DBU
381. WA2CKP
382. WB2PPN
383. JA1-2Ø762/BV
384. AB4ZD
385. YC8EMH
386. WA8RLB
387. N5VWM
388. VE7SKB
389. KB4BCC
390. VE7GSE
391. YC8BWN
392. KN6ER
393. KD1CJ
394. G2BFO
395. KB7ROK
396. VK2EQ
397. 4X4-2175
398. JE1BGL
399. KF2LC
400. WV2X
401. LU5EWO
402. WAØCLR
403. VO1UL
404. VE6AML
405. WD4REX
406. WAØCLR
407. VE3VJC
408. WA1MKS
409. JH6FHJ
410. JE9EMA
411. WK8X
412. TI2YLL
413. KP4WN
414. KD6MOS
415. KI7CM
416. JH1IED
417. JN6MIC
418. BU7FC
419. DLIEMO
420. KD4TWP
421. 5WIGC
422. JA7JI
423. W5RUK
424. LU3OJZ
425. WD4OHD
426. 7L1MF5
427. ON4BCM

428. WØUHL
429. N4WJV
430. LU5DSE
431. HS1NGR
432. DU1SAN
433. 4X/G3WQU
434. K3BSA
435. CP8AK
436. K8IHQ
437. JA7NUZ
438. HL5FXP
439. N9PM
440. K9UQN
441. WA7SNY
442. HL5YAW
443. DS5WQT
444. JH7GZF
445. K6CIL
446. JK1QJE
447. WA8NPX
448. WA9MTP
449. DK6AP
450. DK6YY
451. JA3BKP
452. JA8HIO
453. JH1REP
454. W9HBF
455. N9GM

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6GCB
4. K9FD
5. NØAFW
6. N3II
7. WB1BVQ
8. KA2AOT
9. KI6GI
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/WI
19. WB6FNT
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IUU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVB
30. JA8CAQ
31. KI6WF
32. JAØSU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. W4AFA
39. 5NØWRE

40. KD2WQ
41. VE1ACK
42. N5JUI
43. QØ5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. GØFWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJIT
53. CE1YI
54. YBØHZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. NØ1DT
68. KA1TFC
69. KA4TMJ
70. JA4TF
71. KA3UNQ
72. KB8ZM
73. K2EWA
74. WA1S
75. PY4OY
76. WCØA
77. OZ1FNX
78. KA7EXD
79. ON6DP
80. VE1RJ
81-89. Omitted
90. N6WK
91. WA3KKO
92. KB9ABI
93. SMØBNK
94. WAØQIT
95. 5Z4BH
96. OA4ANR
97. OD5ZZ
98. VE3ZD
99. HL5FRG
100. UB5LRS
101. PS7AB
102. KD1CT
103. DU1CHD
105. IK3ITX
106. VE2JWK
107. N7JXS
108. JM2PRM
109. HL5BUV
110. VE3GLX
111. KK6JY
112. EA6AAK
113. N3IHS
114. WA2CKP
115. VE6AML
116. WAØCLR
117. WA1MKS
118. KD6MOS
119. KP4WN

120. LU5EWO
121. 5W1GC
122. JA7JI
123. W5RUK
124. LU3OJZ
125. ON4BCM
126. WØUHL
127. N4WJV
128. LU5DSE
129. VO1UL
130. DU1SAN
131. 4X/G3WQU
132. K8IHQ
133. K9UQN
134. WA7SNY
135. HL5YAW
136. K6CIL
137. WA8NPX
138. WA9MTP
139. JA8HIO
140. N9GM

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1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. NØAFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6GCB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5NØWRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCQ
20. CE7ZK

21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT
26. KA4TMJ
27. N7GMT
28. JA4TF
29. K2EWA
30. WA1S
31. PY4OY
32. ON6DP
33. VE1RI
34. WA3KKO
35. WAØQIT
36. 5Z4BH
37. HL5FRG
38. JA1-2Ø762/BV
39. VE6AML
40. LU5EWO
41. 5WIGC
42. JA7JI
43. W5RUK
44. LU3OJZ
45. WØUHL
46. N4WJV
47. VO1UL
48. DU1SAN
49. K8IHQ
50. K9UQN
51. WA7SNY
52. N9GM

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT

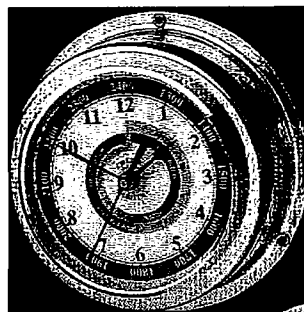
10. N7GMT
11. KD3CQ
12. KB8DAE
13. WA1S
14. PY4OY
15. VE1RJ
16. 5Z4BH
17. N2BI
18. I75OI56
19. VE6AML
20. KB8ZM
21. LU5EWO
22. JA7JI
23. W5RUK
24. WØUHL
25. K9UQN
26. N9GM

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU
5. N7GMT
6. WA1S
7. PY4OY
8. KD3CQ
9. VE1RJ
10. UY5XE
11. IK3ITX
12. VU2SMN
13. JA7JI
14. W5RUK
15. LU5EWO
16. WB2VMV

350 COUNTRIES ENDORSEMENT

1. WB2DIN
2. PY4OY
3. UB4WZA
4. JA7JI
5. KD3CQ



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Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the September issue, we should receive it by June 30. Provide a clear, concise summary of the essential details about your Calendar Event.

JUN 1

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens NY. Doors open for vendors to setup at 7:30 a.m. Buyers admitted at 9 a.m. Free parking. Door prizes, food and refreshments. VE exams at 10 a.m. For VE info contact Lenny Menna W2LJM by calling 718-323-3464, or E-mail [LMenna6568@aol.com]. Admission by donation: buyers \$5, sellers \$10 per space. Talk-in on 444.200 rptr. PL 136.5, and 146.52 simplex. Visit the Web site at [www.qsl.net/hosarc]. For more info call at night only, Stephen Greenbaum WB2KDG, 718-898-5599. E-mail [WB2KDG@arrl.net].

JUNE 2

BANGOR, ME Bangor Hamfest at Hermon High School, Hermon, Me. Time: 8 a.m. to 1 p.m. Admission, \$5.00. Tailgaters, \$5.00. dm. Directions: Interstate 95 to Exit 44 North to Rte #2, left on Rte #2 West for 1-1/2 miles to High School. From Newport, East on Rte #2 to Hermon Corner, then 1/2 mile east on Rte #2 to High School. Talk-in Freq. 146.34/94. Simplex 146.52. Grand Prize drawing At NOON. Must be present to win. Programs: ATV, APRS, ARES/RACES DEMO, TRAFFIC HANDLING, PSK 31, VINTAGE RADIO, ECHO LINK, FOX HUNT, GEOCACHING. Club Web site: [www.n1me.com]. Contact Person: Roger W. Dole, 207-848-3846; E-mail: [rdole@hermon.net].

WINSTON-SALEM, NC Setup Fri. night or 6 a.m. Sat.; gates open 6 a.m. to 1 p.m. Sponsor: Forsyth Amateur Radio Club. Dixie Classic Fairgrounds: I-40 to US52 to Akron Dr. follow signs to fairgrounds, enter Gate 5 off Deacon Blvd. Fleamarket, tailgating, VE Session. Camping hookups available for Friday night. Talk-In: 146.64 (145.47 B/U). Admission: \$5.00; tables: \$15.00. Raymond Taber KG4NTC, 336-786-8241 or 336-723-7388. E-mail for info: [kg4ntc@yahoo.com]. General info: [http://www.w4nc.com].

JUNE 8

WHEATON, IL The Six Meter Club of Chicago Inc. will hold its 46th Annual ARRL sponsored Hamfest on Sunday, June 8th. This is an all-weather location at the DuPage County

Fairgrounds, Wheaton IL, west of Chicago, at 2015 Manchester Rd., north of Roosevelt Rd. (Rte. 38), east of County Farm Rd. Free parking with no extra charge for outdoor flea market space. Donation Auction at 11 a.m., proceeds to ARCI (Radios, test equipment, parts only, no PCs). Overnight RV parking with 110 VAC hookup, advance registration required. Tickets are \$5 in advance, \$7 at the gate. Advance tickets are available from Six Meter Club of Chicago, 7109 Blackburn Ave., Downers Grove IL 60516, or any club member. For more info call the 24-hour InfoLine at 708-442-4961, or see the Web site at [www.qsl.net/K9ONA]. E-mail [WA9RIJ@mc.net]. General parking is at the west gate. Sellers only at the east gate. Handicap parking at the east gate. Gates open at 7 a.m. Buildings open to the public at 8 a.m. Talk-in on K9ONA 146.52, K9ONA/R 146.37/97 (107.2 Hz). ARRL VE Exams 9 a.m. to 11 a.m. — call the InfoLine to pre-register for testing. This event will also feature ARRL, AMSAT and dealer displays. Absolutely no alcoholic beverages permitted. No sale of food or beverages in the flea market. All sellers responsible for cleanup of their spaces!

JUNE 13, 14

KNOXVILLE, TN The Radio Amateur Club of Knoxville will sponsor its 37th Knoxville Hamfest and Electronics Exposition on June 14th at the Cokesbury Conference Center, 9915 Kingston Pike, Knoxville TN, from 9 a.m. to 4 p.m. ET. General admission is \$6. There will be a special Electronics Exposition and "Sneak Preview" on Friday evening, June 13th, from 6 p.m. to 9 p.m. ET. Admission for Friday activities is by advance hamfest ticket purchase only. The advance hamfest ticket package is \$10 and includes admission tickets for both Friday and Saturday events, plus one free tailgate space. On Saturday, inside dealer tables will be available for \$15 each (8 ft. x 30 in.) and the inside facility is air conditioned and carpeted. Outside tailgating is \$5 per space plus a \$6 admission. The Hamfest will feature forums and clinics on Digital RF Communications, Antennas, CW Operating, The Sun and Solar Activity, Amateur Radio Basics for New Hams, Emergency Communications and Amateur Radio, and a special FCC Forum by Bill Cross W3TN from the FCC in Washington DC. VE exams will be given at 2 p.m. ET with advance registration at 1:30 p.m.

Other activities will include amateur radio demonstrations and exhibits plus a large free product literature area. Concessions are on site. Parking is free and there is handicap access. Talk-in on 147.300, 224.500 and 444.575 linked repeaters plus 53.770 rptr. The Web site is at [www.W4BBB.org]. The Radio Amateur Club of Knoxville is also celebrating its 50th Anniversary at the hamfest, and special activities are planned to celebrate this anniversary. For more info contact Radio Amateur Club of Knoxville, P.O. Box 50514, Knoxville TN 37950-0514. E-mail [d.bower@ieee.org], or call 865-670-1503.

MIDLAND, MI The Midland Amateur Radio Club (M.A.R.C.) will sponsor its 26th annual Hamfest on Saturday June 14, 2003, from 8:00 a.m. until 1:00 p.m. at the Midland County Fairgrounds. Admission is \$4.00 per person. advanced table reservations are available for \$6.00 per 8 foot section, and trunk sale space for \$5.00 per space plus admission. FCC exams will be administered, food will be available. (Friday night camping is available on the fairgrounds.) Location: Gerstacker Fair Center on the Midland County Fairgrounds. Use Entrance off Airport Road. For further information and table reservations: M.A.R.C. Hamfest, P.O. Box 1049, Midland MI 48641-1049, or Bill AB8JF, 989-835-5562, or E-mail: [jab8jf@arrl.net]. Also: Lee KC8ITI, 989-652-6213.

MONUMENT, CO Pikes Peak Amateur Association Swapfest will be held on June 14, 2003, at the Lewis-Palmer High School, 1300 Higby Road, Monument, Colorado (just east of I-25 between exits 158 and 161). Prizes include Yaesu FT-817, Yaesu 8900R, Yaesu VX-1R. Forums, VE session, junk auction. Admission is \$5.00. Contact Dennis N0ABC, n0abc@arrl.net. Additional information: Kate Muniz, kcegi@aol.com. Doors open 8:00 a.m. (0600 for sellers).

JUNE 15

CROWN POINT, IN The Dad's Day Hamfest and Computer Show, sponsored by the Lake County ARC, will be held at the Lake County Fairgrounds, 889 S. Court St. in Crown Point, starting at 8 a.m. June 15th. Talk-in on 147.00 PL 131.8 rptr, or 145.52 simplex. Setup for vendors is at 6 a.m. This event is totally indoors and features commercial vendors, indoor flea

market, food and beverages, and walk-in VE exams. You can find more info at [<http://www.qsl.net/w9lj>]; or contact Lee via E-mail at [leeraue@msn.com]; or Rich at [paris156@yahoo.com].

JUNE 21

PISCATAWAY, NJ W2QW, the Raritan Valley Radio Club, will hold "Hamfest 2003" at Piscataway NJ High School (NEW LOCATION), near Intersection of Old New Brunswick and Behmer Roads. Sellers 6:00 a.m., Buyers 7:00 a.m. - 2:00 p.m. Admission: Buyers \$5.00, Sellers \$5.00 (\$5.00 each additional space). Talk-in 146.625(r), 447.250(r), tone 141.3, 146.520(s). Contact person: *Marty Ficke* KD2QK@aol.com, 725-968-6911, or *Fred Werner* KB2HZO, 732-968-7789 before 8 p.m. *Raritan Valley Radio Club W2QW*. Web site: [www.w2qw.org].

JUNE 28

HASTINGS, MI The Barry Amateur Radio Assn. Ham Radio and Computer Swap will be held at Charlton Park, 2545 S. Charlton Park Rd., Hastings MI, 8 a.m. to 12 noon. Admission 12 years and up is \$5. Trunk sales spaces \$5. Indoor spaces \$10 each. Talk-in on 146.46 FM. Vendor info E-mail to [field_day_swap2003@yahoo.com], or write to *Jack K8YPW*, P.O. Box 370, Hastings MI 49058. For VE exam info E-mail *Pete N8ZSG* at [peted@msgexp.net].

JULY 12

OAK CREEK, WI The South Milwaukee ARC Inc. will hold its 36th annual Swapfest on Saturday, July 12th, at the American Legion Post #434 grounds, 9327 S. Shepard Ave., starting at 6:30 a.m. and running until at least 2 p.m. CDT. Free parking, a picnic area, and limited free overnight camping are available. Hot and cold beverages, donuts and sandwiches will also be available starting at 6 a.m. Admission is \$5 per person. Prizes will be awarded during the day and you need not be present to win. A free flyer and map may be had by writing to *The South Milwaukee ARC Inc.*, P.O. Box 102, South Milwaukee WI 53172-0102. Talk-in will be on 146.52 (WA9TXE) simplex as well as on many of the local repeaters.

JULY 13

KIMBERTON, PA The Mid-Atlantic ARC will present their annual Valley Forge Hamfest and Computer Fair, Sunday, July 13th, at the Kimberton PA Fire Company Fairgrounds, Route 113, south of the intersection with Route 23. This ARRL sanctioned Hamfest will be held rain or shine. Sellers admitted at 7 a.m. and buyers admitted at 8 a.m. Admission is \$6. Unlicensed spouse and children of licensed amateur radio operator will be admitted free

of charge. Lots of great door prizes will be available. Many dealers will be there selling amateur radio and computer gear. Demonstrations will also be featured. For inside tables w/elec.. E-mail *Rick Miskinis* N3AGS@reservations@marc-radio.org, or call him at 610-825-9590. Indoor tables are \$10 each for 1 to 4 tables, \$8 each for 5 or more, in addition to admission. Outdoor tailgate space \$6 per space in addition to admission (not available in advance). Food and beverage sales are to be done by authorized vendors only. For more info please E-mail *MARC* at [Hamfest-info@marc-radio.org], or write to *MARC*, P.O. Box 2154, Southeastern PA 19399-2154. Info is also available on the club Web site at [<http://www.marc-radio.org>]. Talk-in on 146.835(-) MHz and 443.800(+) MHz PL 131.8. Watch for signs directing you to the site.

JULY 18, 19

OKLAHOMA CITY, OK The Central Oklahoma Radio Amateurs will sponsor its 30th annual "Ham Holiday 2003" at the Oklahoma State Fair Park, northeast of the I-40 and I-44 intersection, in the Made In Oklahoma building. Doors open 5 p.m. to 8 p.m. Friday, July 18th; 8 a.m. to 5 p.m. Saturday, July 19th. Features: Technical and non technical programs, WAS card check, VE exams, flea market. Pre-registration is \$7, \$10 at the door. Advance flea market tables are \$15, \$20 per table at the door (if available). Electrical hookup \$10. People under 16 years of age are admitted free if accompanied by an adult. Talk-in on 146.82. Additional info and registration forms are available on the CORA Web site at [www.qsl.net/coraneews]. Vendors, E-mail [kc5qcv@cox.net] for details. Send pre-registration to *CORA Ham Holiday 2003*, P.O. 265, Ft. Supply OK 73841-0265.

JULY 19

CARY, NC An ARRL sanctioned "Mid-Summer Swapfest" will be held by the Cary ARC. July 19th, 8 a.m. to 2+ p.m. at the Herbert Young Community Center, Academy St. and Chapel Hill Rd. Talk-in on 145.39-.6. The event is indoors and air-conditioned. Tickets \$4 in advance and \$5 at the door. VE exams registration at 10 a.m. Testing starts at 11 a.m. Walk-ins OK. E-mail to [n4nc@arri.net], or see the Web site at [www.qsl.net/n4nc/] for more info.

JULY 20

SUGAR GROVE, IL The Fox River Radio League of Batavia IL, will hold their Annual Hamfest at Waubensee Community College, Rte. 47 at Waubensee Dr. in Sugar Grove (5 miles NW of Aurora). Talk-in on 147.210(+) PL 103.5/107.2. Doors open Sunday at 8 a.m. Setup is 7 p.m. on Saturday and 6 a.m. to 8 a.m. on Sunday. VE exams start at 10 a.m.,

bring original license, copy of license and photo ID. Contact *Maurice L. Schietecatte* W9CEO, c/o *FRRL*, P.O. Box 673, Batavia IL 60510. Phone 815-786-2860, or E-mail to [scat42@msn.com]. The Web site is at [<http://www.frri.org>].

WASHINGTON, MO The 41st Annual Zero Beaters ARC Hamfest will be held July 20th, 6 a.m. to 2 p.m. at Bernie E. Hillerman Park in Washington MO. Free parking and free admission. Sandwiches, brauts, refreshments and desserts will be available. Features: Commercial vendors, bingo, ham radio and computer flea market, technical sessions and ham radio demonstrations. Additional info and talk-in on 147.24(+) rptr. Watch for green on white hamfest signs. Registration for VE exams starts at 9 a.m. Walk-ins welcome: limit 30. Bring original license and a photocopy. For exam info SASE to *ZBARC VE Exam*, P.O. Box 1305, Washington MO 63090. For hamfest info, contact *Zero Beaters ARC*, P.O. Box 1305, Washington MO 63090; or *Keith Wilson* K0ZH days at 636-629-7368; fax 636-629-0103.

JULY 26

CINCINNATI, OH West Side - Saturday, July 26, 2002, Flea market 6 a.m. - 1 p.m. Air-conditioned inside vendor area 8 a.m. - 1 p.m. Sponsor: OH KY IN Amateur Radio Society. Location: Diamond Oaks Career Development Campus, 6375 Harrison Avenue, Cincinnati, OH (handicapped accessible). This large facility is located just east of I-275 and I-74. Take I-74 to the Rybolt Road/Harrison Avenue Exit (Exit #11). Go east on Harrison Avenue. Diamond Oaks is located on the right (south side) of Harrison Avenue, less than one mile from the I-74 exit. Special seminars, transmitter hunts, indoor vendors, large outdoor flea market, door prizes, VE exams (8 a.m., walk-ins accepted), refreshments, free parking, handicapped parking available. ARRL-approved! Talk-in: 146.670(-) repeater. Admission: Adv. \$5, gate \$6., age 12 and under free. Indoor vendor tables (6 ft. with free electricity) \$10 ea. Outdoor flea market, \$1 per space. Contact *Lynn Ernst* WD8JAW, 10650 Aspen Place, Union KY 41091-7665; 859-657-6161, E-mail [wd8jaw@arri.net]. Web: [www.ohkyin.org].

SWANSEA, MA The Fall River MA Amateur Radio Club will hold its annual Geek-fest, clam-boil, and flea market, Saturday, July 26th, at American Legion Post 303, Ocean Grove Ave., Swansea MA. For more info contact *George KB1CNA* at [kb1cna@msn.com], *Skip KB1CNB* at [kb1cnb@arri.net]; or *Roland N1JOY* at [n1joy@arri.net].

JULY 27

TIMONIUM, MD The Baltimore Radio Amateur

Continued on page 59

Linux Cont., Plus Some Digital Basics

Those of you who have been following the Linux saga have noticed I gave it a breather for a time. Quite a few of you have responded favorably to the project. I left off after successfully getting the Red Hat 8 distribution up and running in the little cheapo box along with KPSK up and on the air, and worked a few stations.

I was highly elated, but had to get back to some of those things that were not quite so off the wall, at least for a time. It was also necessary to make some minor hardware placement adjustments. One kind ham sent me a message concerning a very nice little package to combine the two CPUs using one monitor, keyboard, and mouse. It is the Belkin KVM system.

Not being familiar with this hardware, I was surprised when, during a subsequent visit to the local Office Depot, the system was displayed for all the world to inspect and purchase. I don't know if I would ever have noticed its existence if not for the gentle offerings afforded in the message from the ham. Sometimes we are blind to answers sitting in plain sight.

I have since made a small modification to the clutter caused by too much hardware. I found an inexpensive extension cable for the monitor which allows better placement of the hardware. It is nice to have somewhere to wiggle your legs while you work.

Some other happenings along the way include attempting to set up Win98se on the same hard drive. That seemed to almost be a success except for lack of a compatible driver for the monitor to go along with this slightly offbeat hardware. Sometimes, it is difficult to believe the strange incompatibilities experienced since beginning this project.

However, the need for the Windows on the same hard drive became less pressing and that has slid further toward the back burner. Some of the needs to make this little machine do everything have been solved by other means. One of those was getting a new laptop, which we will discuss in a future column.

So, back to the current and more exciting adventure. In the process of installing the

Windows on this hard drive, I lost the KPSK installation that I had worked so diligently to compile in the last Linux article. This was not so bad because it gave good reason to try a fresh approach to setting up KPSK by simply downloading an RPM file and installing it as an update.

Very slick indeed. Virtually nothing to the process. All I did in this case was go to the download site which was at SourceForge, and download it for the Red Hat 8 distribution. One thing I have to say about this is that the system certainly "knew" its way around. The download automatically went to the Red Hat Linux Home Directory that is default for all downloads.

Next step was simply to double-click the file, and a window popped up explaining the "update" process and it took care of it from there. All I had to do to see that it was installed was simply type in KPSK in the terminal window and the program booted. Another kindly ham had informed me of this process after I had struggled through the entire compiling process previously. Again, the price of education leaves its impressions.

By the way, I have started this month's article using the OpenOffice word processor that came with the Red Hat distribution. It was necessary to specify that it be installed since it was not an item that would have been automatically included in the install.

If you have need for and appreciate a first-rate word processor, this is one you will like. As far as I can see, you can use it for anything you are apt to create, including a full-fledged book with footnotes, bibliography, and index. And one little aside: It is free.

More fun

I had mentioned a while back how I would like to find a full-fledged Linux log program.

I did quite a bit of searching and, truthfully, I found that there are several. Due to some of my as-yet-not-too-well-developed ability to follow instructions (and, perhaps, just a few system incompatibilities), some programs did not pan out well.

However, I came upon a real winner. At least, judging by the ease of installation, I came up with one that really does the job. It is called, simply, "xlog" and there is a screen shot showing some of the results of the labor here in the shack. It can be downloaded from [http://people.debian.org/~pa3aba/xlog.html].

This program was also an easy install. The downloaded file was in .rpm format and did not require any compiling. Very easy and intuitive to use. The data for your QSOs is saved in ADIF format. I assumed that meant I could import an ADIF file, but I could not seem to accomplish that small bit of wizardry. Other than that, it does what you expect. See Fig. 1.

Back to Microsoft with this text

This may not strike you as the high point of the article, but this is where I transferred the article from one computer to the other. It was perfectly intact, but formatting had suffered and, for some unknown reason, when I got it into WordPerfect, the spell checker insisted the text was written in German! A few handsprings later and it was working.

Such is education. I can guess how this happened and will know to watch my step in the future. But stranger things happen just opening documents written by different versions of the same word processor. I get some of the strangest formatting in Word attachments much of the time and that is because I simply do not have the correct version of that program to fit the stuff folks send.

On with the Linux fun

There are a lot of hams enthusiastic about writing ham software for Linux, but it appears to be a complex undertaking. The reason I say this is the documentation that accompanies so much of this software becomes confusing to us "normal" folk who are used to installing Windows software, which usually starts with a double-click followed by a number of Enter keystrokes.

It is truly different from that with the Linux software. And the problem seems to be that there are so many variations of the operating system. I am sure the programmer successfully builds a program and it works just fine on his machine. The tough part is telling us how to get it to work on our Linux machines.

As I progress, I find more ham software available for Linux. Since I started this article, I came across a contest log that looks very good. I went to the Web site and found what appears to be very thorough documentation with all the necessary extracurricular files and instructions for installation. I may be able to get this one going and let you know soon what we have here.

Some hams are still waiting to take the plunge

Recently, I was asked if I had any interesting info I could pass along to a ham who writes a newsletter that goes out to RVers. That sounds pretty simple. I have a whole bunch of past articles that seem interesting to you and me.

There is a difference when you change audience. I thought about this for a bit and recalled that a lot of these RV folks use WinLink2000. This means they are hams and there is more. They have to have a working mobile HF rig and a computer they are carrying about with them.

This means most of them are just a few shakes away from getting into some real fun with digital ham modes. So I wrote a piece on that subject and emphasized how they should be able to take the equipment they already have and, with an expense estimated between 15 and 60 dollars, they could get into more fun than they could shake a stick at.

And that is what we do here as most of you know. (My claim to fame is for being the cheerleader on the sidelines.) My first lash-up for PSK31 cost less than \$15. It was simply two audio cables to and from the rig and the computer. I manually toggled the rig between transmit and receive and had so much fun it was about three weeks before I even stopped long enough to build a PTT circuit.

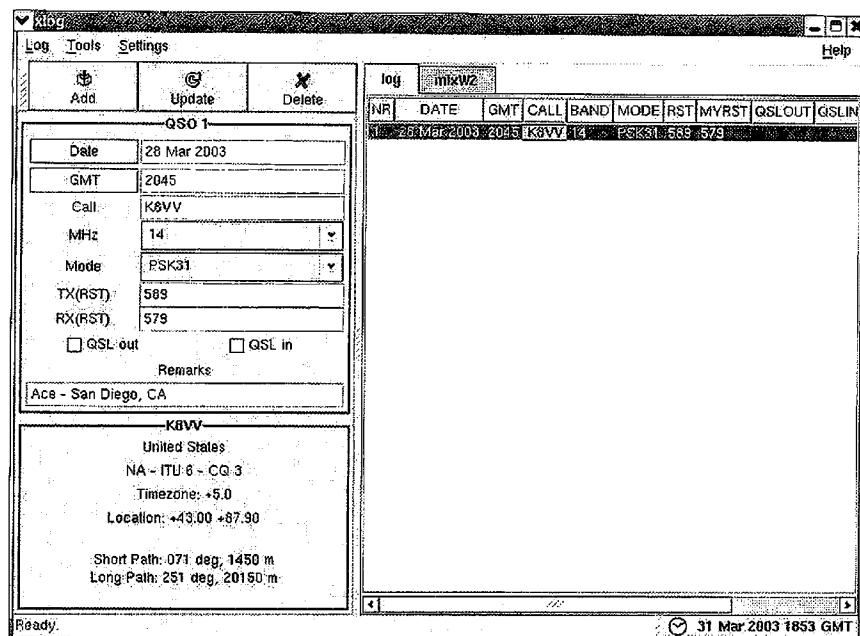


Fig. 1. *xlog under Linux* — This is a full-fledged standalone log program that is easy to install (see text) and saves the entries in ADIF format. I only made one contact while getting this in place. It is recorded and in the edit or update mode so you can see some of the features. The notes are hidden in the log display on the right, but you can scroll to read them. There is a place to enter your location info, which then makes it possible to determine beam heading. Of course the station I worked was not really in the "8" call district, so the info was incorrect, but you can get the picture. A good piece of software and there is at least one other module that will work with it to read the info from your rig. I did not get into that as I was just after the good looking log.

And you know what? Those same two audio cables are still in there working to this day. I have never succumbed to the purchase of a commercial interface. This is not to say those commercial offerings are not good or that there is anything wrong with them. To tell the truth, none of them were on the market when I got started. The only interface I recall from that early era was a project published in QST. I have talked to hams who are using that one and they are happy as clams.

The story is simply this: Any way and time you can get a good clean signal on the air and you are satisfied with the operating environs, you've got a system that works. If that is your goal, you have arrived in digital ham heaven.

So ... for the ham on the sidelines: How to start digital ...

Probably the most important essential to getting started on your digital ham adventure is what you already possess. By the sheer nature of being a ham, you are hyped about all the ways we can communicate via the airwaves. I know I have never gotten over the thrill of picking this invisible signal out of the air on a piece of wire and

decoding with the rig to find a signal that none of my neighbors has the faintest clue is there. It doesn't have to be from the other side of the world to give me that euphoric fix. It just needs to exist from somewhere, and when I answer him he hears me and we can "talk."

I recall my first CW contact that was over a span of about 30 miles. It was truly a thrill. Then there was voice which was another thrill, but not as great as that which required the mastery of the Morse code.

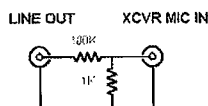
The latest and greatest thrill? A few years ago, when the first PSK31 software for Windows by G3PLX became available, I rigged two audio cables between the Icom accessory port and the SB16 soundcard and tweaked knobs and audio driver sliders until I made a contact. Wow! I was in hog heaven and I had spent less money than my first one-tube CW transmitter had cost to build.

That was a great day. I have never looked back. The microphone gathers cobwebs and the CW paddles are usually dusty. I am using the same two cables to this day with some refinements, but those cables, in the

Continued on page 44

Transmit Audio Connection

Connect a shielded audio cable between the transceiver MIC input and the soundcard LINE OUT jack through a 40 dB attenuator, consisting of a 100K series resistor leading a 1K parallel resistor. This attenuator will reduce the soundcard LINE OUT level from about 1 Volt down to the normal MIC input level of about 10 millivolts, so the higher soundcard output level does not overdrive and distort the transceiver MIC input.



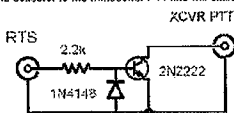
If the transceiver is equipped with a high-level auxiliary input, then the attenuator is unnecessary, and the transceiver auxiliary input may be connected directly by shielded cable to the soundcard LINE OUT. If using the auxiliary input of the transceiver, be sure the transceiver microphone is disabled when operating PSK63, to prevent illegal modulation of the transceiver in the CW band by sounds picked up by the microphone!

TIR Connection

The transceiver's VOX can theoretically be used to control the transmit/receive function, however it is often difficult to adjust for reliable operation while still maintaining the proper audio levels needed to preserve an undistorted PSK output signal. For this reason, DigiPan provides for positive control of the transceiver's PTT via the RTS and/or DTR outputs of the computer's RS-232 serial port.

Signal	DB9 Connector	DB25 Connector
RTS	Pin-7	Pin-4
DTR	Pin-4	Pin-20
Ground	Pin-5	Pin-7

The RTS and DTR outputs of the serial port are not directly compatible with the PTT control of most transceivers. The serial port outputs +12 to +15 VDC for transmit and -12 to -15 VDC for the receive condition. Transceiver PTT circuits on the other hand, generally require a ground for transmit and an open circuit for receive. For most modern solid-state transceivers, a simple NPN switching transistor (2N2222 or equivalent), with a 2.2K resistor inserted in series between the base and the serial port, emitter connected to ground, a diode connected between the base and emitter (to prevent the -12 to -15 VDC from reaching the transistor), and the collector to the transceiver PTT line will suffice.



Connect a cable from the computer RS-232 connector to the transceiver PTT line, through a switching transistor as described above, using pin 7 or pin 4 if a DB-9 (small) connector, or pin 4 or pin 20, if a DB-25 connector (large).

Fig 2. Two excerpts from the DigiPan Help file — You can find just about every bit of necessary info in the DigiPan Help file to get your rig connected to your computer. Plus, of course, the file includes instructions to use the software. I talk to a lot of hams who start with this program and are so satisfied they just keep right on using it. "Why change? It ain't broke." See the text for instructions to find this software and also info to find at least one of the popular commercial interfaces. You really don't have to touch a soldering iron to get started in digital ham fun unless you want to.

THE DIGITAL PORT

continued from page 43

beginning, constituted all the hardware expense it took to get started.

You too can do this

And it is much easier today. The software has improved and there is an abundance of very good freeware available. I always suggest starting with DigiPan, for several reasons. Not just because it is good as well as free, but it is easy to install, set up, and use. And there is one more really big plus — The Help file is particularly helpful in that it shows exactly how to connect those cables as well as how to build a PTT circuit.

One more thing to give you a little boost: It is not mandatory to have a PTT circuit. What that does is toggle the transmit/receive functions automatically from the software

through keyboard or macro commands. You can do as I did in the beginning and simply do that operation manually with the transmit button on the front of your rig. I did that for about three weeks. I was having so much fun, I just did not want to take the time to build the simple little circuit. Other hams I know have done the same thing.

This is my recommendation. Go to The Chart on my Web site and scroll down to Line 17 and go to the DigiPan Web site. Download the free program and install it. This is a very simple, straightforward install. Run the program and click on Help. It will tell you all there is you need to know to get the software up and running.

Plus — The really big plus is in the instructions to connect the soundcard to your rig. Take a look at the screenshot from the Help file and you will see just how simple things can get.

Then, if you do not feel you want to invest time in rolling your own, go back to The Chart and click the link on Line 10. This will take you to one of the popular reasonably priced commercial interface sites where you can get going either with a kit or a fully assembled interface with a cable to plug into your rig. It just can't get simpler than that.

So, if you are wanting to get started yourself or if you have a ham friend who needs a little shove, this is all the information you need. Get to it and I will see you on the air. One of the really nice things that happen in my life is to talk directly over the air to

someone who got started in digital because they read about it here. It does happen every once in a while. Logistics and propagation should be the only barrier. Ease of getting started is covered.

One of those software hassles

From time to time I have to busy myself with Web site stuff. For my own, what I refer to as a utility Web page, I am not too fussy. I have nothing posted for sale. The site is simply there to provide info for the ham community.

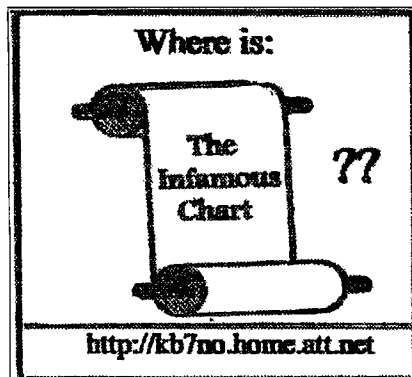
But every now and then, someone asks for an attractive Web site for a specific purpose and I find myself at a loss to deviate from my normal black words on white background layout. I have found a very nice piece of freeware that is very powerful called 1st Page 2000 (perhaps a takeoff on the Frontpage name?) that I have been using. It does everything except manufacture cute little patterns similar to what we might call watermarks for the background.

I was searching for something to do that and came across an old "trial" package of Microsoft's Frontpage that came equipped with a big thick book of ideas and how-to stuff. It seemed a bargain. I took it home and installed it, and when I opened it, I was very surprised to see a program nearly identical to what I had been using for the past year, except that it had an option called themes. Some of that looked like what I was seeing here and there on the Web.

Well, to keep this from getting to be a lengthy dissertation on an off-topic, some parts of this theme plan did not work, but the background I was after was intact, so I started working with it and found that, as with a lot of these editors there was a limit to the flexibility. So I found that the theme, once embedded, would transfer to the old editor, and the flexibility was back.

This was all very nice, but trying to follow the rules, I checked with Microsoft and discovered the version of Frontpage I had the trial copy for was so antiquated (close to 3 years!) that there was no support nor update available. Such is the way with proprietary software. I didn't really expect to be shut out so quickly, but it was a learning experience I thought worth passing along.

It certainly looks as though I can continue to use the 1st Page software, and perhaps snag a few of these themes for future reference and have a more powerful HTML editor than I anticipated. What I am saying is simply that if you want a good, powerful HTML editor to fit your budget (free is



A New HF Mobile Installation

A few months ago, the XYL got a new car, so I, of course got the "hand-me-down." The price of being cheap, I guess. Naturally, I got the 2-meter/440 MHz rig in right away, but it has taken a bit longer to figure out what I wanted to do as far as an HF rig goes.

There are many steps to having a good HF system to operate mobile. In today's cars you need to figure out what will fit and where before you even begin thinking about the specific characteristics of the radio. Unless, of course, you do not have the need to carry passengers, children's car seats, groceries, etc.

In the past I have used a Ten-Tec 580 Delta, a Kenwood TS-120S, and most recently a Kenwood TS-130S. All of these rigs are fairly standard-sized, but when mounted on a "hump mount" they were reasonably workable. Not perfect — but reasonable. I liked the performance, but I wanted to have a more secure mount this time around and a mounting position that made it easier to see and reach the controls on the front panel.

As any good ham would, I checked out the available options and agonized over exactly which rig would best meet my needs, especially since I have a tendency to keep a rig for an extended period of time. These days there are a number of good choices for mobile installations. After an appropriate amount of Internet surfing and comparing notes with other hams, I decided that the Alinco DX-70T would have all the capabilities and features I desired. It is all-band, covering all amateur frequencies from 160 meters to 6 meters. (I have to admit that up till now my rigs had a top end of ten meters, so I had never operated on six meters. The chance to try something new added some appeal to the decision.) On high power it puts out 100 watts, but when set to low power the ten-watt output can extend battery life significantly.

I figured that in an emergency I could remove the rig from the car and operate it off a deep cycle battery with a solar charger almost indefinitely. The rig can be mounted as one contiguous unit, or the control panel

can be installed almost anywhere, with the main body of the radio mounted in a location such as under the seat. The controls are neither complicated nor difficult to see — a major advantage both for mobile operations as well as for those of us who wear bifocals.

I checked various sources and compared prices. The latest version of this radio is the "TH", but the only real difference is that it has higher power on 6 meters. The nearly identical DX-70T is often available used and at a very attractive price. Several times I thought I had successfully landed a rig through one of the on-line auctions, only to be beat out at the last second by a dollar or two. If you've ever had this happen to you, you know how frustrating that can be.

Eventually there was one listed with a "Buy It Now" price that was competitive with the prices I had seen other rigs sell for, so I entered my bid and was informed that I was indeed the winner. About a week later I had the rig in hand, and spent some time perusing the manual before I charged ahead with the installation.

My son Paul (N8YDQ) happened to be visiting from Florida, and together we tackled the installation. Hopefully that won't dissuade him from visiting again in the future. The first task was to run power from the battery to the planned location of the rig. I examined the firewall for any point that would provide a place to pass the power cables. None were to be found. Eventually



Photo A. With the new HF rig installed, I have access to the "low bands" for DX as well as 6 meters, just for fun. The ashtray mount was almost a perfect fit for the Alinco DX-70T.

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I found a removable rubber plug in the floor. I routed the cables from inside the car through a slit in the rubber plug so that it acted as a grommet and will help prevent any cutting through the insulation.

About 12 inches of the cable runs under the car, and I used cable ties to securely position it away from exhaust pipes, gas lines, etc. I then routed the power cable through the engine compartment and connected it directly to the battery. I found heavy-duty copper lugs that could be connected to the bolts on the battery cables. Make sure you use heavy-gauge cable if the supplied cables are not long enough. The local home improvement chain store fixed me up with stranded cable with red and black insulation. I believe it was 8 gauge — about 1/4" in diameter.

Next came the question as to where to locate the rig itself. My car is a 1996 Ford Taurus, and there isn't a lot of spare space available. One disadvantage the car suffers from is that the center console swings forward if you plan on using the cup holders. I had hoped to mount the rig in such a manner that I could keep the cup holders, since a little coffee is welcome on long drives. I had planned on using the remote control panel feature since it has worked so well for my Kenwood TMD-700A. However, there isn't much room available that would seem to work.

It is important to locate any installation out of the way of the air bags so that nothing gets launched in the event of an accident. Between that and the layout of the controls for the car, options were limited. I looked at floor-mounting the rig, but felt that this was impractical because it would make the controls too difficult to reach. Paul came up with the idea of removing the ashtray. Initially we thought we could mount just the control head in that space and floor mount the main portion of the radio. The reason we decided against that was that the control panel extended just as far when mounted alone as it would if the entire rig were installed as a single unit. In either case, the flip out cup holder would hit the radio. Ah — the price we pay for our hobbies! The cup holder will now remain in its stowed position.

The fit for the radio was tight, but that has certain advantages such as a more "finished" appearance. The standard bracket would not fit, so some generic mounting brackets were used. There are lockable mounting brackets available for floor mount or under-dash installations. If you are thinking of using that kind of mount, check out Bill Roth's home page — [\[http://home.att.net/~wroth/wsb/html/view.cgi-home.html.html\]](http://home.att.net/~wroth/wsb/html/view.cgi-home.html.html) — where he has mounts available for the DX-70.

While I was crawling under the dashboard doing the installation, I decided that a few other small things could be done. I finally made a cable for my GPS so that it not only could communicate with my APRS but also would be powered by the car's electrical system. To help prevent a battery problem, I installed a switch under the dash so I can shut off all the auxiliary items when I park the car. I also looked at various options for dash-mounting the GPS unit. After looking at cellular telephone mounts, radar detector mounts, etc., I decided that good old Velcro® was the most practical method.

I'll be writing about antennas in more detail in the near future, but for now I will tell you that I used an MFJ trunk lip mount that accepts PL-259 base antennas. In my collection I have a number of antennas with that mount, so I grabbed a 20-meter resonator and attached it to the mount. Twenty meters is sometimes a good mobile band. The antenna covers a fair segment of the band without being overly large, although you do have to compete with the "big guns" out there. Naturally a mobile installation is never going to compete with full legal power and stacked monobanders on the top of a tower, but it can be a lot of fun.

If you want to get a good idea as to how well your installation is working, watch for a good contest. Shortly after my installation was complete, the CQ Worldwide WPX contest was scheduled. In this contest operators are working as many stations as possible and mobile stations are a multiplier — they count for more points. As such, working a mobile station is highly desirable. If you want to see how well your rig works, try running mobile during such a contest. I quickly made a number of contacts from American and Canadian stations, so I knew the rig was working properly.

I did make the modifications so that the DX-70T can operate on the MARS frequencies. Now I can operate mobile for both fun and for emergency operations in support of ARES or RACES as well as MARS. More importantly, I can pass the time when I have an extended drive working a little DX.

So what are the secrets of a good mobile HF installation? First, a rig that has a good "fit" with your operating requirements. Second, a safe and solid rig location that is easy to see and easy to reach. Third, a heavy-gauge connection directly to the battery. And finally, a reasonable antenna. As I mentioned earlier, I'll be writing about mobile antenna choices in the near future.

Awards and Field Day

Last month, we surveyed books and other publications about amateur satellite operation. Armed with these resources, the hamsat enthusiast can do a little research to provide new opportunities and challenges. How about awards and contests? They're not just for HF activity. Here are a few to get you started.

The Radio Amateur Satellite Corporation, AMSAT, has a number of operating awards available for their members and others who chase the hamsats. Difficulty ranges from extremely easy for the Satellite Communicators' Club, to the challenging W4AMI Satellite Operator Achievement Award. We'll focus on the introductory programs.

Satellite Communicators' Club

If you are already active on the satellites, this is an easy one. The award is available to any operator that has made one hamsat contact. For newcomers, it can be quite an adventure just to make a satellite contact, similar to that first-ever ham-radio QSO. To apply for the certificate, you need only send \$1 if a member or \$2 if a non-member, along with contact data and two units of postage to AMSAT Awards Manager Bruce Paige KK5DO, P. O. Box 310, Alief TX 77411.

OSCAR Satellite Communications Achievement Award

This one takes a little more work. You must make 20 "contacts" using any satellite. A contact is defined as a QSO with a station in a different state, DXCC country, or Canadian call area. If you have five QSOs with stations in Manitoba (VE4), only one counts toward the award. The fee is \$3.50 for AMSAT members and \$5.00 for non-members. Photocopies of both sides of the QSL cards should be sent, along with two units of postage, to Bruce's address above.

South Africa AMSAT Satellite Communication Achievement Award

The requirements for this award are

similar to those of the OSCAR Satellite Communications Achievement Award, with some subtle differences. The award is for 25 QSOs with different stations via low-orbit satellites. All of the contacts could be made with stations in Texas, but they must not be with the same station. Contacts via high-orbit hamsats like AMSAT-OSCAR-40 (AO-40) do not count. Bruce handles submissions for this award for those in North America. Fee, submission info, and return postage requirements are the same as those for the OSCAR Satellite Communications Achievement Award.

What's next?

AMSAT has other awards with more difficult requirements. You can find out more on the Internet at [<http://www.amsatnet.com>]. In addition to extensions of the awards noted above, they even have one for 1,000 contacts via satellite, the Robert W. Barbee, Jr., W4AMI Satellite Operator Achievement Award. Other organizations like the American Radio Relay League (ARRL) also have satellite-specific award programs. They include hamsat versions of their popular Worked All States, Worked All Continents, VUCC, and DX Century Club.

Field Day 2003

It's that time of year again; Summer and Field Day! Each year, the American Radio Relay League (ARRL) sponsors an emergency preparedness exercise called Field Day. The event takes place during the fourth weekend of June. Individual hams and ham clubs compete to make as many contacts as they can from remote locations using emergency power and portable stations. For 2003, Field Day starts at 1800 UTC on June

28th and continues till 1800 UTC on the 29th (2100 UTC for those who begin setup no earlier than the beginning of the event). The Radio Amateur Satellite Corporation (AMSAT) promotes its own version of Field Day for operation via the hamsats, held concurrently with the ARRL event.

While the ARRL [<http://www.arrl.org>] rules provide a 100-point bonus for the successful completion of a single amateur-radio satellite contact, the AMSAT rules promote activity on all of the current operational satellites. The AMSAT [<http://www.amsat.org>] rules worked well last year. A key point to remember is that only one contact per each FM, single-channel satellite is allowed. Even with this rule, those stations with dual-band HTs using simple whip antennas won't have much success. It's just too congested. Stations that have completed their single contact via a particular FM satellite are encouraged not to make any further contacts via that satellite during the Field Day period. If one of the astronauts is active on the International Space Station for Field Day, only one contact is allowed per station for the duration of the event. One digital contact via the ISS packet digipeater or PCSat (Nav-OSCAR-44) is also allowed. PCSat has serious power problems and will only be available if control stations feel that the satellite's battery situation can survive the event.

The first-place emergency-power/portable station will receive a plaque at the AMSAT General Meeting and Space Symposium in Toronto, Canada, October 17-19, 2003. Certificates will be awarded for second and third place, emergency-power/portable operation, in addition to a certificate for the first-place home station running on emergency power. Stations submitting high

award-winning scores will be requested to send in dupe sheets for analog contacts and message listings for digital downloads. Check the AMSAT Web page for details and a sample entry form.

There are some good reasons to consider participating in the AMSAT event if you are serious about chasing satellites on Field Day. The AMSAT rules recognize the individual hamsats as separate bands, thus promoting the pursuit of all of the "birds" for the duration of the event. AMSAT also encourages digital satellite activity. Special Field Day messages are sent to the "digisats" for download points by anyone who can receive them. It's even possible to participate in the AMSAT event and get points without a license. While monitoring the downlink from the digisats, complete short Field Day greeting messages can be received without ever transmitting. Each Field Day message download is worth three points.

Making choices

It would be nice to try to work every active hamsat in the sky on Field Day, but it's just not possible without a lot of gear and a lot of club members or active participants in the satellite chase. The best thing

to do is to pick satellites that have transponders, either analog (voice and CW) or digital (1200 or 9600 baud), for which you have equipment.

If you are considering ONLY the FM voice satellites like UoSat-OSCAR-14, AMRAD-OSCAR-27, or the SaudiSats (SO-42 and SO-50), don't — unless you are simply hoping to make one contact for the ARRL rules bonus points. The FM voice satellites turn into a solid FM-repeater pileup during Field Day. It's fun listening, but that's not what Field Day is all about. Diversify. Gear up for other voice/CW hamsats.

If you have worked the satellites on Field Day in recent years, you may have noticed that a lot of good contacts can be made on some of the less-populated low-earth-orbit satellites like Fuji-OSCAR-20, Fuji-OSCAR-29, and AMSAT-OSCAR-7. During a typical workweek, contacts are few and far between, but during Field Day the transponders come alive like 20 meters on a weekend. The good news is that the transponders on these satellites will support multiple simultaneous contacts. The bad news is that you can't use FM, just low duty-cycle modes like SSB and CW.

This will be the second year for AMSAT-

OSCAR-40 on Field Day. Predictions show good opportunities (depending on your location) at the beginning of the event and during early Sunday-morning hours. It should be a very good year for AO-40.

Equipment

The best radios for Field Day are the ones you use at home, unless — of course — they are heavy antiques. If you have one of the newer, all-mode HF/VHF/UHF transceivers, take it with you. If you don't have one, find someone who does, and borrow it. Be sure that it can transmit on the satellite uplink band while simultaneously receiving the downlink band. Practice prior to the event. There's nothing worse than trying to figure out a strange radio while you are hunting for a satellite, keeping tabs on uplink and downlink frequencies, and adjusting for Doppler — all at the same time. Don't forget to take a backup station.

Be prepared to at least work SSB and CW on Mode J (two meters up and 70 cm down) via the Fujis. With a nice set of two-meter and 70-cm directional antennas, AO-7 Mode B (70 cm up and two meters down) can be a lot of fun. A station that is ready for AO-7

Continued on page 50

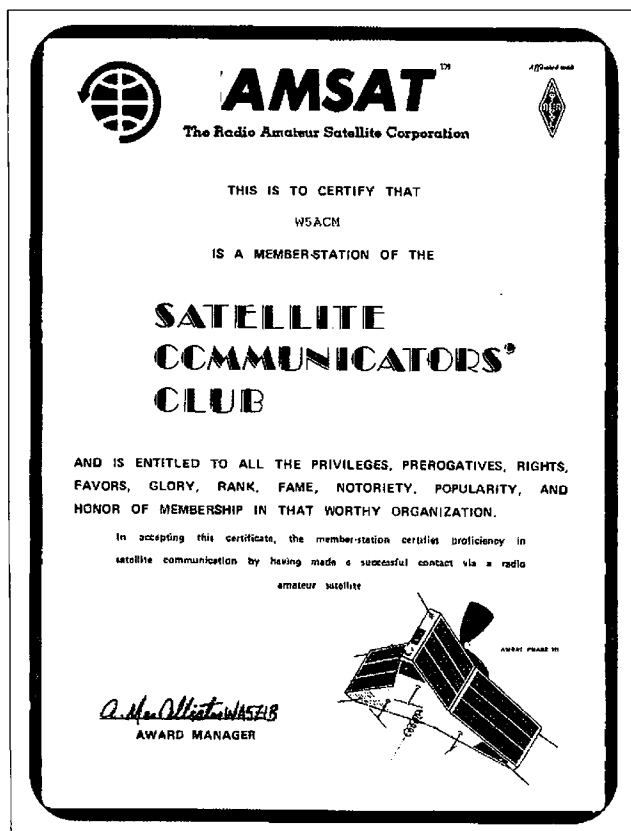


Fig. 1. The Satellite Communicators' Club certificate.



Fig. 2. The OSCAR Satellite Communications Achievement Award certificate.

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HAMSATS

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is just a small step away from Mode U/S via AO-40. The 70-cm uplink for AO-7 will do fine for AO-40, and the two-meter receiver can be used as the "IF" or intermediate frequency for an AO-40 S-band (13 cm) downconverter. There are now many easily converted and cheap downconverters available. Check out [<http://members.aol.com/k5oe/>] for some ideas.

Unless you have experience with low-power satellite work, don't try satellite "QRP" on Field Day. It's really hard even for the best satellite operators, and can be quite difficult and disappointing to demonstrate to potential newcomers. There are too many inexperienced satellite operators on the air during Field Day and many are trying to deal with noisy generators, bugs, and unfamiliar radios. Listening for weak stations is too much to ask.

Antennas

A simple system for AO-7 Mode A (two

meters up and 10 meters down) can get by with a dipole in the trees for 10-meter reception and a ground plane in the clear on the two-meter uplink. For the other satellites and modes, most serious satellite operators will have a VHF/UHF antenna system that will rival many home stations with large, circularly polarized yagis positioned by azimuth and elevation rotors. Something in between these extremes should suffice. A small dish with an S-band downconverter can easily be included in any medium- to large-size satellite array designed for two meters and 70 cm.

Predictions

Don't assume that you can take a laptop computer to Field Day and do your predictions after you get there. Plot all of your potential satellite passes in advance for every satellite you intend to pursue. Check the results. Look for timing conflicts. Instant Track 1.50 from AMSAT provides some scheduling functions that will help, and it runs on almost any PC. Make sure that the coordinates of the Field Day site and recent satellite element sets have been entered into the software. Don't forget to take along some satellite frequency guides (unless you are one of the few that has memorized all the uplink and downlink bands for all of the operational hamsats in orbit).

Also, check the operating status of your target satellites prior to Field Day. For example, AO-7 is usually in Mode B, but can come up in Mode A when you least expect it. Be ready for surprises.

Power and interference

There is nothing worse than having all the gear, antennas, predictions and accessories ready to go, and then discovering that you can't hear anything but noise on the downlink frequencies. It happens a lot. Noisy power sources are the number-one culprit. If you can operate with batteries, do it. Satellite chasing is considered weak-signal work. Most of our hamsats only have a few watts output to simple antennas. They can be hard to hear. A typical consumer-grade gasoline generator can produce a lot of noise in the RF spectrum. Be sure to test your generator prior to Field Day. Check it with your satellite rig for a few passes. If it is noisy, either cure the problem or get another power source.

Don't forget about "the other guy." Most Field Day operations include multiple stations for HF, VHF, and satellite work. The folks in the tent next door on 70 cm can ruin your best attempts to make Mode-J contacts. Coordinate with them so that they can go to another band or take a break during those short intervals when the Fujis or FM hamsats come by.

If your group operation has any terrestrial VHF stations or two-meter packet systems, they can destroy any chances you might have had hearing AO-7 on Mode B with its two-meter downlink. As with the UHF folks, make your intentions known and arrange for an operating schedule, in advance. Even with all these precautions, it is always a good idea to isolate the satellite station from the others.

There are even a few potential interference problems associated with S-band reception of AO-40. Microwave ovens and wireless 2.4 GHz devices like wireless LAN cards and portable phones are at the top of the list. It is doubtful that there will be a problem, but check first! A lot of mobile homes have microwave ovens, and hams tend to be techno-geeks who collect new RF toys just to see what they will do.

Have fun!

You may have multiple rig difficulties, antenna failures, computer glitches, generator disasters, tropical storms, and even satellite problems, but the goal is to test your ability to operate in an emergency situation. Try different gear. Demonstrate satellite operations to hams who don't even know that the hamsats exist. Test your equipment. And finally, have fun doing it!

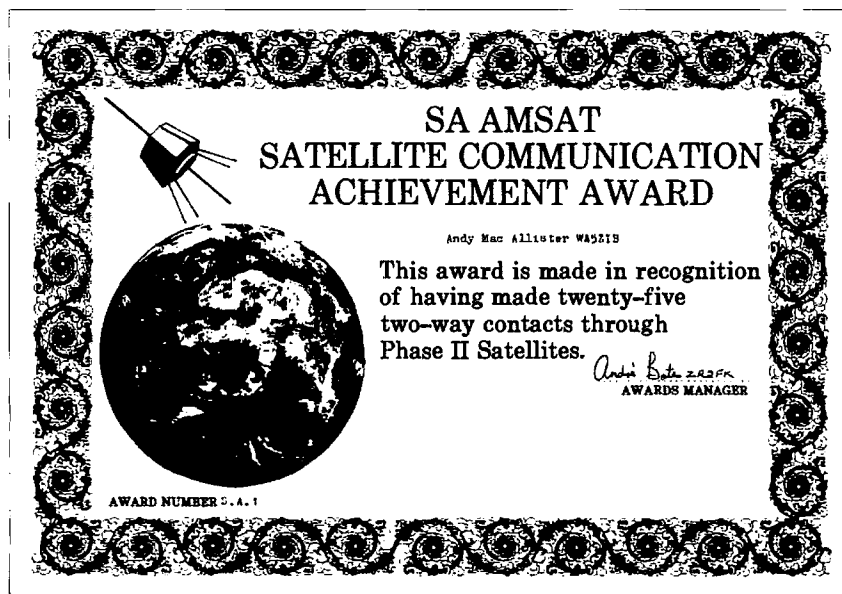


Fig. 3. The South Africa AMSAT Satellite Communication Achievement Award certificate is available from AMSAT-NA.

The Argonaut V

The new Ten-Tec Argonaut V QRP transceivers are now shipping. After a few false starts, the units began to arrive late October of 2002. I've talked about the new rig several months ago, so I won't go into great detail again. However, a quick overview should be in order.

The Ten-Tec Argonaut V is a DSP-based HF transceiver covering all HF ham bands in all modes. It is also known as the Model 516. It will operate in AM, FM, SSB, and CW modes. Of course, you get the famous Ten-Tec QSK CW break-in keying with the Argonaut V. There's an internal CW keyer built into the Argonaut V.

There are two VFOs and 100 internal memories. You can have an almost unlimited amount of memories using an external computer controlling the Argonaut V. To know where you're at, the Argonaut V uses seven-segment LEDs for the main and secondary displays. There are several green backlight enunciators as well.

The Argonaut V transceiver will also provide general coverage receive from 500 kHz to 30 MHz. The receiver boost is 0.2 μ V typical for 10 dB S+N/N @ 2.4 kHz bandwidth sensitivity. You have at your fingertips your choice of up to 34 DSP-generated filters built into the Argonaut V. These range from a rather narrow 300 Hz to a 6-kHz-wide filter for shortwave AM broadcast listening. The FM mode bandwidth is set at 15 kHz.

The Argonaut V's transmitter puts it into a class other than pure QRP; the output can be adjustable from 1 to 20 watts via a front panel control. The RF output is ALC-stabilized.

You can order the optional TXCO and get frequency stability of ± 3 ppm or ± 20 ppm without the TXCO. Either with or without the TXCO, the Argonaut V is PSK31-ready out of the box, but take it from me and order the optional cable set from Ten-Tec. It will make your life easier!

And like all the current Ten-Tec rigs, the Argonaut V is equipped with Flash-ROM to enable instant upgrading via the Internet.

The Argonaut V requires 12 to 14 volts at

500 mA on receive and up to 6 amps on transmit at 20 watts. The Argonaut V tips the scales at five pounds.

First impressions

Let's face it: First impressions are lasting ones. And, out-of-the-box, the Argonaut V surprised me. Ten-Tec, while making great strides in quality in the last several years, always seemed to be a step or two behind the other guys when it came to fit and finish. With the Argonaut V, that problem is now over. The fit and finish of the rig is outstanding. Everything fits like it should. The legends are clear and crisp. The main tuning knob is a heavy zinc affair with lots of mass. In fact, I would bet the first thing most people will say when they open the box up is, "I am impressed."

Digging deeper, and pushing some buttons on the way

The Argonaut V comes with a power cord, mode 701 hand microphone, instructions, and miscellaneous connectors. Hookup is simple and to the point. Apply +13.8 volts to the radio and turn it on.

The Argonaut V operates very much like its older brother, the Ten-Tec Jupiter. The "Func" control on the Argonaut V is the same as the "multi" on the Jupiter. These controls, along with the band and VFO controls, are very much alike. Within a few minutes after powering up the rig, I was making contacts. It really is that easy to operate.

More buttons to push

Changing bands is a simple process of pushing the band button. You cycle through the bands. You can't go backwards. You can press the FUNC key and BAND key to store

your current frequency in the stack register. There's one stack register for each band! This makes hopping around a bit quicker. Or you can use the memories. More on that later.

Some buttons provide more than one function. For example, pressing the FUNC button and then the A/B button turns on the 20-dB RF attenuator. Some buttons are mode-dependent. The keyer button will only work in CW mode. Speaking of keyers, the internal keyer works just great. You set the speed by the multi knob. You also have control over the weight of the CW shaping and sidetone frequency, CW offset, and sidetone volume.

Nearly all the functions of the Argonaut V are controlled this way. The VOX works the same way as the keyer; you control the different VOX functions using the multi control. The VOX controls the QSK feature of the rig in CW mode.

When in these "subset" modes, the secondary display is used to let the operator know what is going on. The values may show the bandwidth or the amount of RIT being used. The display is somewhat encrypted, and it takes a bit of practice to read some of the results. For example, when in the VOX mode, the display will show "Gn", which means VOX Gain.

Memories

The Argonaut V has 100 internal memories. These hold the band, along with mode and other information for that specific memory location. The memory operation in the Argonaut V is a bit odd. It's not hard to do, but somewhat different from what I've seen in other gear.

The radio can be in either VFO mode or

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QRP

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memory mode. You select either one by alternate presses of the VFO/Memory button. While in memory mode, you can select one of the 100 internal memories via the multi control. Once you have selected the memory location you want to use, you rewrite it back into the VFO. There is no "mem recall" button used in other transceivers. To write a memory location, you dial up the band, frequency, mode, and bandwidth, etc., you like. Then press the function button and write button while in VFO mode. This will cause the display to show the last used memory channel number and its contents. The multi knob allows you to scroll through the memory channels or to move to an empty channel. A second push of the write button actually executes the copy operation.

To access the memories, pressing the V/M button will cause the MEM light on the enunciator row to glow. This lets you know you are in memory mode. Again, the multi knob allows you to scroll through the memory channels. Pressing FUNC and WRITE while in MEM mode WRITES the current memory BACK into the current VFO. It's not as hard as it seems, but it's very easy to get the steps out of sync and you end up rewriting the wrong stuff in the wrong location. It's a matter of practice until you get the sequence down correctly. The Argonaut V sports the usual RIT and XIT. There's also a very usable PBT control. There's a squelch control for the FM mode and for general scanning of the VFO or memories. The squelch is useful on all modes.

You can have the Argonaut V scan for a busy frequency via the VFO or memories. You can program the scan to skip busy frequencies and to scan backwards.

Multifunction meter

The Argonaut V's S-meter is quite busy. Besides the S-meter function, the meter also provides for setting the output power to five watts, measuring reflected power, measuring SWR, and measuring power amplifier current. To read the various ranges, you place the rig in CW mode and key it with a microphone's PTT. To measure PA current, you key the mic, and push the A/B button. The PA current of between 0 and 7 amps is read on the S-meter scale. To read SWR, again you press the PTT line while in CW mode and then press the SPLIT button. The SWR is read on the 0-25 watt power scale with a 1.0:1 SWR at 10 on the scale. A 2.5 SWR would read 25 on the scale. There's a lot of information to be displayed on the meter and it can become very confusing. Unless you use these functions all the time, keep the manual nearby; you'll need it.

Operating with the Argonaut V

The Argonaut V operation is pretty much straightforward. Select the band, frequency and mode. The QSK works just great with no pops or clicks. I use the internal keyer and have no problem with it. SSB operation is just as straightforward. Select the proper sideband for the band in use and adjust the mic gain so that the ALC LED just flashes. There's plenty of gain, and it's easy to overdrive the circuit, so make sure you have the gain set correctly.

Nits to pick

I truly believe there is no such thing as a perfect radio, and of course the Argonaut V is far from perfect. There are some things that I don't care for. Not that they're wrong or bad, it's just not to my liking. I don't like tuna salad, but that does not make it bad for those who do! So, in no particular order, here goes:

1. Band selection is only one direction. You can't back up if you miss the band you wanted. No big deal, but it is a pain in the butt. Perhaps a software upgrade will fix this.

2. You're not given enough information on the status of the radio. For example, you can't tell if you have the attenuator on unless you toggle it off and on while watching the effect on the S-meter. The same goes for the main tuning lock. The only way to know if you have the tuning locked is to try to tune the radio. If it does not tune, then the lock function is on! Now, having said that, I understand why some of the functions don't have a status enunciator: lack of space on the main display. To get everything on there, a costly LCD would have been the only choice. That would have raised the cost of the radio considerably.

3. Whoa! I can't believe there's no automatic notch on a DSP-based radio. Perhaps a software upgrade will address this problem, too.

4. If you buy the optional fans for the PA heatsink, they run all the time.

5. Not a problem for me, but for those that must have one, there is no RF gain control on the Argonaut V.

6. The radio does not work very well at operating voltages under 12.5 volts. At 12 volts, things get a little dicey.

But ...

All and all, the Ten-Tec Argonaut V is a super radio. I've had mine now for about six months and have just been amazed with its performance. No matter if I've been on SSB on 40 meters or FM on ten meters, the audio is great. The CW QSK is probably the best yet from Ten-Tec.

If you think that QRP just may not be your cup of tea, the 20 watts of RF that the Argonaut V produces will generate a lot of contacts. QRP operators at the five-watt level, too, will be at home with the Argonaut V with just a twist of a knob.

Ten-Tec has produced a great little transceiver. No matter if you like to run five watts or go for the gusto with twenty watts, the Argonaut V will serve you extremely well.

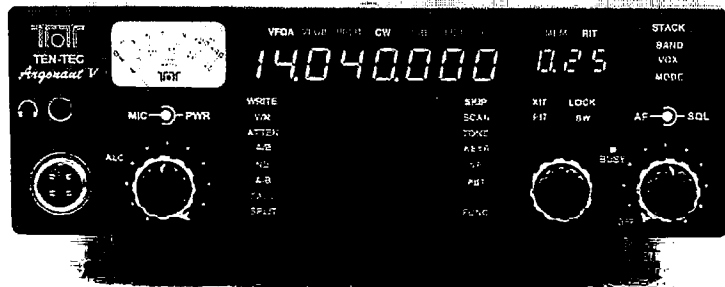


Photo A. The Argonaut V.

Tracking Opportunities — Owls, Bats, and PLBs

I have found hundreds of hidden radio transmitters over the years. Each time it has been fun and exciting, but never more so than the first time I tracked down a radio-tagged animal.

It wasn't too hard, because that tag was on a slow-moving desert tortoise. Nevertheless, that experience made it clear how much can be learned about wildlife this way.

Biologists want to know about the effects of habitat, diet, dispersal, migration, and predation on species of concern. Radio tracking is an important tool for them. However, it's not easy for a few researchers to track critters that move large distances, such as migratory birds. They sometimes use small aircraft for radio tracking, but that's very expensive and requires consistent good weather.

That's where hams come in. We're scattered throughout the country, most of us own equipment to monitor VHF frequencies, and many of us are interested in using our hobby for public service.

Learning about owls

For five years, ham operators in central and western states have carefully tuned their receivers each fall and spring, listening for weak pulsed signals from radio tags on Western Burrowing Owls (Photo A). We've provided volunteer support to researchers in the state of Washington and the provinces of Saskatchewan and Alberta.¹ This ongoing project has helped researchers learn the migratory habits of these threatened birds, which have been shown to travel almost 2,200 miles to their winter homes in Mexico and southern states.

Unlike other Strigiformes, burrowing owls nest underground in holes that have been dug and then abandoned by other animals such as ground squirrels. They require suitable habitat consisting of open fields with adequate food supply for foraging, roosting sites, and low vegetative cover to allow them to keep watch for predators.

As a result of uncounted hours of effort by researchers, park rangers, birding

enthusiasts, ham operators, and scanner fans, a great deal has been learned about the Western Burrowing Owl. Much of the news is not good. On 7 April 2003, a coalition of conservation groups, including chapters of the Audubon Society, petitioned the California Fish and Game Commission to list this bird under the California Endangered Species Act.

"California supports the largest remaining breeding and wintering populations of the species," states the news release accompanying the petition. "Many early accounts of the burrowing owl reported that the species was one of the most common birds in California. They historically ranged throughout the Central Valley, in coastal areas from Marin County south to the Mexican border, and in sparsely inhabited desert areas in northeastern and southeastern California.

The release continued, "Surveys conducted throughout most of California during the early 1990s documented a nearly 60 percent loss in the number of breeding owl colonies known from the 1980s, and a decline in overall population numbers by eight percent per year. Breeding owls have recently been completely eliminated from five counties and are nearing so in at least six others.

"Over 71 per cent of California's breeding owls currently live in the margins of agricultural land in the Imperial Valley, an area that accounts for only 2.5 percent of the land area of the state. Over 15 percent of the state's breeding owls reside in the southern Central Valley, an area undergoing explosive human population growth and rapid conversion of agricultural lands to urban development."

It's Florida's turn

This spring, hams in the Sunshine State

and nearby will have a chance to participate in studies of this fascinating bird. Robert Mrykalo, a graduate student in the Environmental Science and Policy Department at the University of South Florida at Tampa, is studying Florida Burrowing Owls. This is a slightly different subspecies, thought to have a range limited to Florida and the Keys. However, there is one 40-year-old report of a sighting in North Carolina. Researchers have banded these birds in the past, but none of the banded owls has been recovered after leaving its breeding home.

"These owls are unique due to the fact that they dig their own burrows," Robert writes. "Florida Burrowing Owls are



Photo A. Burrowing owls are unusual because they prefer grasslands instead of forests. A new opportunity for hams to help study them is beginning soon. (Photo by Joe Moell KØOV)

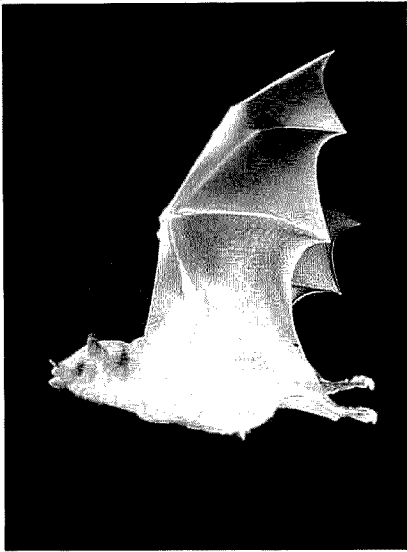


Photo B. This Mexican Long-nosed Bat has a face covered with pollen. Biologists want volunteers knowledgeable in RDF techniques to help track these bats in a Texas project this summer. (Photo by Merlin D. Tuttle, copyright Bat Conservation International, used by permission)

currently listed as a 'Species of Special Concern' due to a reduction in population size because of loss of suitable habitat.

"My goal is to place necklace or tail-mounted transmitters² on the owls and attempt to follow them from late spring through summer this year," Robert continues. "There has been past telemetry work conducted on burrowing owls in Cape Coral, Florida, but the owls dispersed past the receiving distance of the telemetry receivers. The researchers were unable to locate the owls using aerial surveys. I found it fascinating that ham and VHF monitors were able to assist in locating transmitter signals! The one concern I have is that the owls on which I have placed transmitters will disperse large distances. I do not think I will have sufficient research funding to conduct aerial surveys."

Robert and his associates will place transmitters on Florida owl hatchlings, beginning in April or early May. They will track them locally as they leave their burrow nests and learn to forage. Between July and September, the young owls will take off for parts unknown. Nobody knows why, since there will still be plenty of rodents, insects, and other food for them.

Nobody knows where they will go, either. Perhaps a 73 Magazine reader will copy a tag signal and provide a valuable clue. Better yet, maybe a transmitter-hunt-

ing ham will track down one of the tagged owls for a positive sighting.

For more information on this project, including the list of all active tag frequencies when available, visit the "Homing In" Web site. You'll also find ideas for suitable receivers and antennas, plus other tips on hearing wildlife tags. If you want to get earliest notification of projects like this, plus an opportunity to exchange correspondence with wildlife researchers and other volunteer monitors, join the Biotrackers E-mail reflector. Subscription information is at the "Homing In" site.

Bats in the cacti

My Burrowing Owl Project Web page and Biotrackers mailing list have attracted favorable attention throughout the research community, so more biologists are enlisting the help of hams, scanner enthusiasts, and transmitter hunters. One of them is Angela England of Bat Conservation International (BCI) in Austin, Texas.³

"Mexican Long-nosed Bats are the nighttime equivalent of hummingbirds," Angela writes. "They feed on the nectar and pollen of giant agaves, also known as 'century plants' or magueys. These endangered bats are highly migratory, capable of flying long distances in a single night, and are thus highly efficient pollinators for these plants (Photo B). Yet little is known about how much time they spend each night foraging, how far they go in a single night, or what landscape areas they use."

"This summer we will be radio-tagging 25 of these bats in Big Bend National Park," Angela continues. "Due to the small size of these animals, we can only use the tiniest of transmitters, and the batteries only have a 10- to 14-day life span. We plan to collect as much information as possible during this time frame, and are looking for volunteers to help."

"Between June 23rd and July 11th, the main crew of about 10 people will be hikers, who will carry portable directional antennas and receivers to high areas to record signal direction and strength data minute-by-minute throughout the night. We could also use one or two vehicle-based people to be stationed around the periphery to monitor and potentially chase any tagged bats that leave the park. (Last year one of our tagged bats left the park and was last heard approximately 27 miles away from the roost.) We would prefer to have all volunteers be hiking-capable, so we can interchange harder and easier assignments nightly."

"We are asking for a two- to three-week time commitment from all volunteers,

because we need the data to be collected in a consistent manner. We'll be providing all training, food, lodging, and equipment, but if you happen to have your own receivers and antennas, we'd love it if you could bring them! We'll be using the 150, 151, and possibly 149 MHz bands. Even if you can't commit that much time, if you happen to be in west Texas, southern New Mexico, or northern Mexico during that time frame, you would also be welcome to listen for our tagged bats on your own."

What an opportunity for physically fit transmitter hunters! Hiking in Big Bend Park would be a great way to get in shape for the USA ARDF Championships in Cincinnati at the end of July.⁴ The "Homing In" Web site will carry the latest details on the status of this project, along with frequencies and contact information for BCI.

Personal locator beacons legalized in USA

Another way that transmitter hunters serve the public is by becoming volunteers for organizations that track down activations of aircraft Emergency Locator Transmitters (ELTs) and maritime Emergency Position Indicating Radio Beacons (EPIRBs) (Photo C). Beginning in July, big changes are coming to the world of emergency beacon tracking, as the FCC permits these beacons to be used by individuals in addition to pilots and boaters.

Aircraft ELTs activate upon severe impact and transmit continuously on 121.5 and 243.0 MHz with a distinctive whoop-whoop tone. Power is only about 100 milliwatts, so ground range is only a few miles at most. However, they can easily be detected by the SARSAT/COSPAS system of satellites.

As I explain in detail in my book,⁵ USA's SARSAT and Russia's COSPAS satellites are in low Earth orbit and use the Doppler frequency shift that they observe while passing over the beacon at high speed to determine ground position. Two passes are needed, and data can only be collected when a satellite is above the horizon for both the beacon and a ground station. That means it takes at least two hours for a good fix.

Another problem has been that 121.5/243 MHz ELT transmissions are anonymous. The satellite can't tell whose ELT is squawking, or even be sure that it's an actual ELT. Occasionally an ELT alert turns out to be something else, such as word processing equipment.⁶

In 1988, EPIRBs were authorized to use 406.025 MHz in addition to the other two frequencies. The 406 MHz transmission is a short high-power burst of digital data that

includes a unique identification. Not only did this help solve the anonymity problem, but satellites could store this data when out of range of a base station for later forwarding. That shortened the alert time cycle considerably. The newest EPIRBs now have built-in Global Positioning System (GPS) receivers and can include GPS coordinates in the data stream.

As of last year, there were 82,000 registered ELTs and EPIRBs in use, plus an estimated 500,000 of the older unregistered units. One source claims that they have enabled rescues of 14,700 persons in the last 20 years. With evidence like this, why wasn't this technology made available to hikers and other individuals who might need rescuing, too?

Other countries, including Canada, Australia, and Russia, have set up programs to permit individuals to carry Personal Locator Beacons (PLBs) and activate them manually when they need rescue. PLBs use the same transmitting frequencies and satellite detection system as ELTs and EPIRBs, but they have somewhat less stringent design and feature requirements, making affordable pocket-size units possible. Despite success elsewhere, FCC steadfastly refused to legalize PLBs in the continental USA through the 1990s.

Opponents of PLBs feared that they would become so popular that false alarms and inappropriate activations would clog the system, detracting from its primary maritime and aviation uses. They cited examples from Canada, such as the New York man on a solo two-week canoe trip in the Northwest Territories who missed his connection with the bush plane that was to pick him up. Even though he had plenty of provisions to stay a while longer, he chose to set off his PLB, triggering a rescue with Hercules aircraft and helicopter flights that cost the Royal Canadian Mounted Police about \$100,000. In another case, a man and his son on a kayak trip set off their PLB because they were tired and "it was becoming hard to paddle." A Twin Otter came to bail them out and almost crashed trying to make a landing at their campsite.

Arguing that inappropriate use by a few shouldn't be the sole reason to deprive everyone else of a useful rescue tool, proponents kept up the pressure. In 1995, a pilot program began in Alaska to allow PLBs in the wilderness under a cooperative agreement with National Oceanic & Atmospheric Administration (NOAA), U.S. Air Force, Coast Guard, and Alaska State Troopers. In a recent year, there were 54 rescues attributed to these PLBs, many of



Photo C. Cathy Livoni KD6CYG enjoys hidden transmitter hunting on the ham bands. She also tracks aircraft ELTs as a volunteer with the Civil Air Patrol. (Photo by Joe Moell KØOV)

them snowmobilers stranded in subzero temperatures.

In January 2000, FCC issued a Notice of Proposed Rulemaking on the subject. Of the comments received, less than 22 percent opposed authorization of PLBs in the rest of the USA. A favorable Report and Order was adopted on September 27, 2002. Beginning July 1, 2003, 406 MHz PLBs may be sold and used in the USA. Each must be preprogrammed with a unique identification code. The purchaser must send in the supplied registration card with the ID code and other pertinent information to NOAA immediately.

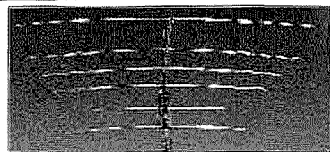
For PLBs bought by wilderness outfitter businesses to be rented for short periods to hikers, kayakers, and so forth, the new rules require the outfitter to provide a 24-hour contact number to NOAA, for rapid determination of who's sending alarms from rented PLBs.

There are strict technical standards for PLBs, so you can't build your own. In addition to 406 MHz digital burst transmissions, they must also beacon continuously on 121.5 MHz, with a special "P" identifier in Morse code to distinguish them from ELTs and EPIRBs. To make PLBs pocket-sized, the 121.5 MHz transmitter can run as little as 25 milliwatts. The battery must be able to power the PLB for 24 hours after activation, following a shelf life of at least five years.

It's expected that street prices of PLBs

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Continued on page 61

Converting 11 GHz LNB Preamps to 10 GHz

Since the first article in 73 Magazine on converting the beige Channel Master LNB to a 10 GHz preamp, many questions have surfaced. The first and foremost concerns whether LNBs can be used for this same TV satellite service. And the answer is a resounding yes.

Well, yes with some reservations. Those reservations come in the form and factor of considerations of the LNB you acquire. They're all usable — it's just that some in the conversion are harder than others to adapt to coax output tapoff of the final RF amplifier to SMA transition. That's assuming that the input remains waveguide input.

Other questions suggest conversion to SMA input also, and while that is possible, some noise figure questions remain. Let's deal with the basic conversion applications between models, speak in general as to what needs to be done to convert an LNB, and then let you evaluate what needs to be done mechanically with the unit you pick up.

Regardless who made the converter you have, they are all made to operate in the same frequency range for satellite converters. That is, in the 11.7 to 12.2 GHz region, with circuitry broadbanded enough to allow operation in the 10 GHz band by removing any RF amplifier OUTPUT filter. We are sticking with the single RF amplifier circuits (an LNB with one RF preamp, not one with two RF preamps, and regardless of the number of RF amp stages, usually 2 to 3 for a single RF amp). The dual RF preamps are usually made for both vertical and horizontal orientation switching from the TV converter for orientation desired and will not be covered here. Let's stick with the single RF amplifier LNB conversion. Surpluswise, I feel that these LNB converters are worth about \$10 to \$15 each, with easy-to-convert units demanding slightly greater dollar value.

Basic operation can be checked, with the source being a simple Gunn oscillator or signal generator set to a frequency in the original passband of the amplifier, 11.5 to 12.7 GHz. Internal to every LNB is a mixer

and a local oscillator (usually a DRO, dielectric resonator oscillator). That's a big word for an amplifier that is made to feed back RF coupled through a high-Q dielectric ceramic sort-of-aspirin-pill-looking device turning the amplifier into a feedback-controlled oscillator.

This oscillator (LO) is offset about 1.5 GHz from the operating frequency, producing an IF frequency of 1 to 1.5 GHz. Testing is to power up the LNB with a bias "T". A bias "T" is simple to construct: It's just a small box with a feedthrough capacitor and 2 coax connectors, a mica capacitor and a RF choke. The dipped mica capacitor ties between the input and output connector, its value being something near 10 pF.

On the input side of the bias "T" (LNB side), a small RF choke connects to the feedthrough capacitor to feed +DC for amplifier LNB power. This voltage can be between +12 and +18 volts DC. It is applied in with the IF signal feeding the DC-isolated receiver converter on top of your TV set. (In normal applications, the DC bias is part of the receiver on top of your TV set.) In any case, power and IF signals cohabitate the coax between the LNB and receiver, isolated by the chip capacitor in a bias "T". To test, power the bias "T" with +DC 12 volts. I placed the converter input into my spectrum analyzer set to the IF frequency of 1 to 1.5 GHz.

Any LNB can be tested in this way, copying a weak signal loosely coupled through its waveguide input to the spectrum analyzer or other receiver of choice that can copy these 1 GHz signals. As long as your LNB takes +DC voltage, they all can be measured up between each other by reading the gain on the spectrum analyzer or S-meter on your wide-range monitor receiver. All the converters I have from Channel Master are

positive DC power. However, be sure of what you have. There could be some out there that are negative DC. Just check first to be sure what you have. They have been plainly marked as to polarity.

The RF amplifiers that lie within the units can be made to function on 10 GHz with little investment. Most of the units that I have been able to obtain in surplus were of the Channel Master series. The iterations were many, and you could see developmental changes in style and manufacturing techniques differing between models greatly. However, all taken with a grain of salt, the basics are still there. Each unit is powered with a DC source feed up the coax to an "F" connector on the rear of the LNB, feeding anything from +12 to +15 or so volts with

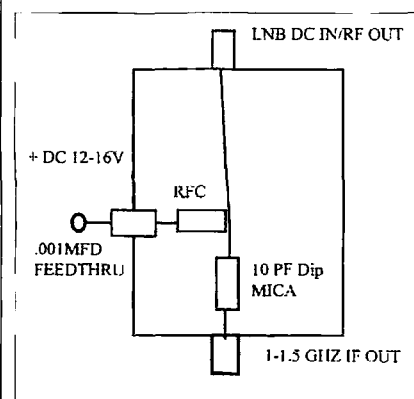


Fig. 1. Drawing showing construction of bias "T" for use in testing various LNBs. Voltage and polarity of DC voltage depends on LNB model. Most of the Channel Master LNBs that I have seen require anything between +12 to +24 volts DC. I basically keep my voltage in the +14 to +16 volt range for all tests, as there is a +12 or similar voltage regulator internal to all of the LNBs I tested.

internal regulators taking care of the lower voltage used by the internal circuitry. This internal supply feeds the RF preamp, local oscillator, and IF amplifier. All negative voltage for bias for the FETs in the preamp is also generated by the internal power supply for gate bias. Couple the circuitry of a mixer and internal filter, which is usually connected to the output of the RF preamp and mixer input, and you're ready to sail into the conversion process to 10 GHz. The thought here is that if the LNB basic tests show it to be functional, it can't turn out to bad even if it gets smoked, as the investment is minimal and this is the worst scenario.

Disassemble the case rear nut, push out the case of the LNB, and remove appropriate covers protecting the power supply, IF, mixer, and RF preamp circuitry. What you're trying to ascertain is how to shut down the DC to the LO and cut the circuit board with an X-acto knife on the output of the last stage of the RF preamp/RF filter input to remove the filter from the circuit. You want to leave enough of the filter to serve as a pad to allow insertion of a 1 to 2 pF chip capacitor from the stripline feeding the filter (last-stage RF amp output) to a filter element used for a connection PC board pad. The remaining part of the filter is used to support a small section of 0.085 miniature Teflon hardline coax to couple the RF preamplifier out rather than feed the filter output to mixer input. By removing DC power to the IF amplifier and the LO oscillator, DC current will be slightly reduced and the oscillator being disabled will not interfere with the operation of the RF preamplifier circuitry. That's the easy part, not the

clever part that makes the conversion easy or harder. Just leave the components in place and cut DC supply lines with an X-acto knife to remove DC power.

The reassembly of the RF preamplifier requires that the metal shield removed to gain access to the circuitry must now be put back into place. Holes or compartment cuts need to be filed or drilled to accommodate the added chip capacitor depth on the circuit board, and passage for the 0.085 hardline coax to allow the cover plate to be reattached with the extended new RF preamp output. The cover plate is important in that it prevents the circuits from "talking" between each other and isolates them in small, "rat race"-looking compartments to prevent crosstalk and unwanted oscillations between compartments so shielded. What I did on the black LNB was to notch with a file the bottom of the compartment cover to allow the SMA connector and its 0.085 coax to extend out of the rear body of the LNB. Solder the coax shield to the ground external rail on the outside of the body of the LNB PC board. Continue to solder this ground to part of the RF filter (now disabled) for coax strength. This part of the solder to the filter has no electrical properties but does add strength to the miniature coax. Make sure the new coupling capacitor has room in height and does not short out when the cover plate is reattached.

Conversion of the Channel Master black LNB, part #6246-01

The black LNB is marked 11.7 to 12.2 GHz, 1.3 dB noise figure. My conversion of the black LNB was essentially the same

electrically as for the large beige LNB unit. Differences are in the connections for power supply and IF input from the mixer connections between the power supply PC board and RF amplifier board.

To locate these two leads, position the board with the power supply towards you with the waveguide to your left. Locate the red lead on left bottom and unsolder it. At right bottom, the white clear lead is IF out of mixer — unsolder this lead also. That allows you to gently lift the power supply board to a near vertical position. This will allow you to unscrew the cover to the DRO LO assembly and remove it. Take the cover off easily. The board is held down by two leads to the RF board topside, DC power in and RF LO out to mixer. These leads can be observed on the RF preamp board top just left of 12 o'clock positions on the board. The LO output goes to a stripline filter element and the DC power lead comes in from the top left and is terminated just below the LO output lead. Unsolder both these leads on the RF amp board.

Extract the DRO LO unit from the center of the housing. Disable the IF amplifier by removing DC voltage from the devices marked "R37". These are the IF preamp's four stages (I left them alone). Then disable DC voltage to the MMIC amp by removing the MMIC or removing the resistor tied between MMIC output and the "F" connector center connection. I just removed this connection for tests. Supply a new DC power lead to the "F" connector power as DC input +12 volts. Reattach the screws holding down the power supply PC board and voltage regulator.

Conversion to the RF amplifier board is

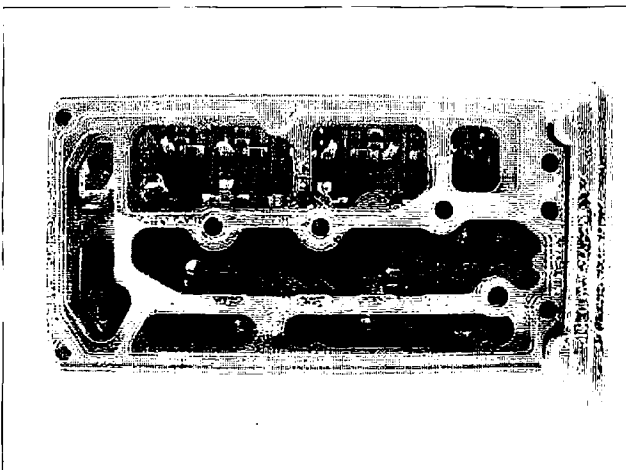


Photo A. Top view of black LNB with cover plate removed and "rat race" compartment shield in place. RF amplifier stages shown at top of picture. Coax hardline would exit out left center of LNB under shield plate and soldered to PC board ground.

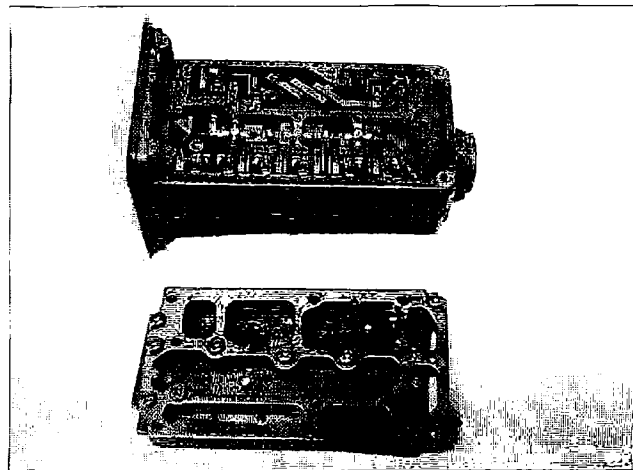


Photo B. "Rat race" compartment cover removed and RF amplifier 3-stage amp, bottom of PC board. Waveguide input to left and output circuitry for coupling to 0.085 hardline for amp output to right.

nearly the same as for the large beige unit. Cut on bottom right enough of the filter lines to allow an isolation chip capacitor to be installed on the stage three output to part of the first input line of the bandpass filter. Make sure it will clear the top cover plate used for isolation between stages. This allows a connection point from the capacitor to the 0.085 coax line. The SMA connector on the far end serves for RF out of preamp. Cut/file a hole in the bottom of the RF amplifier isolation plate to allow RF coax to exit housing and provide rigidity. It would be best to use miniature rigid coax like 0.085 hardline. I don't have any quantity to supply, but found a short section of Teflon coax about 2 inches long with an SMA female connector on one end, and prepped the other end for insertion on amp stage 3's output chip cap. Should work. Haven't had time to try it out, but believe should be OK. Test and adjust as necessary.

Conversion of the Channel Master large beige LNB, part #NJR2115-FH

The noise figure was 1.1 dB on the unit I selected to convert; it varies a few tenths of a dB between units.

Start by pulling the unit apart. Remove rear "F" connector nut and press LNB assembly out of housing. LNB IF amp and LO assembly resides sandwiched between the RF amp PC board and the power supply PC board. To access and remove the LO and IF assembly, remove all screws from the power supply board. Unsolder the three leads just above the 1 watt resistor and varistor. This frees DC power and bias and the +12 volt DC input to power supply board. (Do not unsolder any of the 6 wires in similar black cable.)

Remove all screws holding the RF amplifier PC board shroud and top cover plate, giving access to RF amp board components. Looking at the 6-wire black cable that connects to the power supply board and the waveguide to your left, the three RF amp devices run from (input) bottom left to bottom right (output). Notice that there are 2 wires soldered to the RF amp board, top left side of PC board. One is LO injection to FET mixer, and the other, topmost left, is DC power to the DRO local oscillator. Unsolder both leads from the PC board. This should allow you to gently lift both the power supply and RF amplifier PC boards off the metal housing. Use static prevention measures, as the RF amplifier input gate is now unprotected and with a little static mishandling you could destroy the first RF amp FET. Use a grounded workstation (unetched PC board ground straps and grounded soldering iron station).

With the power supply and RF amplifier board removed, now unscrew the LO board and IF amplifier board from the center of the housing and set aside; it is not required in the conversion. Replace the power supply and RF amp board, and screw down the power supply board first. Position the RF amplifier board and prepare it for stripline modification. As above, with the RF amp positioned so that the black 6-conductor cable is at 6 o'clock, the first-stage waveguide input is to the bottom left. On the bottom right, the output of the stage-three amplifier is a filter presumably set for 11.7 to 12 GHz. Two GHz is not modifiable and needs to be cut off with an X-acto knife. Leave the first element that is capacitively coupled to the stage three output. About 1/8th of an inch from the ground end of this first element, cut a 1/16th-inch open in the path. The ground will have a 0.085 section of hardline coax to ground. The center of the 0.085 coax connects to the open end of the cut, which is the output of stage 3. Leave the capacitive coupling lines for DC isolation.

Exit the 0.085 hardline through the rear of the housing above the "F" connector, and solder the coax to ground. The top cover plate needs to be filed out to accommodate the round coax hardline; I suggest firmly improving rigidity, as the ground surface on the PC board is quite narrow but a good ground. Improves rigidity. When that is done, screw the top housing in place and the top cover plate. Attach to the power supply board a new DC input lead. Attach to rightmost pin of the 3 pins previously unsoldered. You can verify the pin as it wires directly to the power diode under the black varistor on the right side near the varistor. The other side of the diode goes to the voltage regulator, leftmost pin; center pin, ground; right pin, regulated DC output. DC input can be anything from +15 volts to +24 volts DC; I recommend +12 VDC. Check for shorts, and when ready, apply power and test as 10 GHz amplifier. Now it's an LNA and not any longer an LNB.

Now, the last question: Why remove the waveguide input and convert to SMA connection? While it seems to be easier to use an SMA connector for the input, making them more desirable for conversion to existing systems, there remains a point to consider — that is, keeping them in original input circuitry (waveguide) and adapting them to the feedpoint of your dish using a waveguide switch for transmit/receive switching. The RF preamp is at the most desirable point in the system, with minimum loss from the antenna to the preamp input.

A consideration for best receiver applications is to position the preamp as close to the antenna as possible. The loss from antenna to preamp input adds up to reduce the system noise figure in any system with a preamp. If your losses are 3 dB and your preamp has a 1 dB noise figure, the system noise figure will be 4 dB or slightly greater in this simple example.

If you have to be SMA input, use a WR-75 SMA transition to waveguide for the interface or do some machine shop modifications to bring out the inner lip of the waveguide. Replace the probe with an SMA connector and 1 pF chip cap for isolation and give it a try. I haven't done this, as I don't have anything more than my vertical mill, a drill press.

I hope this gives you some confidence to try out these many different models of LNB in the surplus market, as they should be in abundance at inexpensive prices. If you can't find any to convert, I will supply either the black or large beige LNB described, tested good, for \$20 each postpaid US. Canadian destinations, please inquire. Best 73, Chuck WB6IGP. For questions about this and other applications, E-mail me at [clhough@pacbell.net].

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QRP Antenna Showdown

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the quietest antenna of the bunch. Eliminating the noise floor allows weak signals to almost jump right out at you, giving the illusion of some sort of gain factor. The super loop is somewhat fragile; a sharp jolt can break the capacitor's rotor away from its stator assembly. I know, it happened to me. Although not very portable, this antenna works well on travel trailers and cabin installations.

As with the Miracle Whip, the ATX/MFJ 1899 also provides wide frequency coverage. The multiple loading coil taps allow for very fast frequency changes in the field anywhere from 80 meters up through the UHF bands.

The MM-20 was the only antenna that included a built-in mount making it self-supporting. The MM-20 is not much of a shortened antenna, as it is a full 1/4 wavelength vertical on several bands and on others it requires very little use of the loading coil. If needed, the large, 2-inch high-Q coil needs only to be tapped a couple of turns to

obtain resonance. Three sets of full-size tuned radials for each band are provided with the antenna.

The Maldol monobander antenna is the simplest, smallest, and least frilled of all the antennas I used. Several have experimented using two of these as a rotatable dipole, with some real success. 73

Now Hear This!

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diaphragm touching the nail head. This is easier than you may think. A piece of cork gasket material was cut to fit on the piece of wood with the protruding nail head. Before gluing in place check the clearance with the magnet attached. It may be necessary to file down the nail head a little more to gain clearance. A few finishing touches: (1) Glue a piece of circuit board to the back and solder the #32 wire leads. (2) Fabricate a covering for the diaphragm from wood or aluminum with a 1/2" hole in the middle; make a spacer of thin cardboard (approximate thickness of two index cards) to go between the covering and the diaphragm edges; secure with screws in the four corners. Congratulations! Your home-brew magnetic headphone is complete. Have fun!

Performance

Although it cannot compete with the best magnetic headphones that exist, it performs well. The strongest local AM stations can easily be heard, and sometimes on a good night more distant ones can be heard, too.

Parts sources

Hosfelt Electronics, Inc.
2700 Sunset Blvd.
Steubenville, OH 43952
1-800-524-6464

All Electronics Corporation
905 S. Vermont Avenue
Los Angeles, CA 90006
1-800-826-5432 73

Yes, I Built Sixteen Log Periodic Antennas!

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This one is only suited for the higher bands due to the rear mast height. The vertical DLP will usually have a lower angle of radiation than an equivalent horizontal DLP. It will generally not be too good for short-haul on 20m or 15m, but might be better on longer, multihop circuits. The one tested here worked extremely well on 10m.

Being vertically polarized, it is more subject to man-made QRM. This type is only suggested as a space saver or possibly for mounting on the roof of a building where length may be available but with insufficient width for a four-mast horizontal DLP.

Fig. 8 illustrates a single band vertical monopole LP using ground radials suited for a 40m or 80m beam.

The advantage of the monopole is that only a single high rear mast is required (which might be the tower for a rotary beam), plus a shorter wood pole for the forward mast. As the vertical radiating elements are only $1/4\lambda$, the rear mast can be approximately one half that required for a vertical DLP, **Fig. 7**, for the same frequency. A rear mast height (for **Fig. 8**) of 15.24m (50') is required for 40m; 22.87m (75') for 3.8–4.0 MHz; or 24.39m (80') for 3.5–4.0 MHz.

The disadvantage is that at least 30% more antenna wire is required for the monopole LP using ground radials, compared with a DLP.

A vertical beam of this type should have an open area in the direction of the beam. Aiming toward a hill, heavy wooded area, etc., should be avoided due to its low angle of radiation. From the tests made here, a two- or three-story dwelling in the beam's path seems to give about 5 dB attenuation. No doubt the plumbing, electrical wiring, or air conditioning ducts either resonate or give sufficient screening to cause this attenuation. It is therefore suggested that vertical beams be used only on open terrain having good ground conductivity. Avoid trees or other obstacles in the path of the beam.

The ideal location for a vertical beam of this type would be at a coastal

area as near the shore line as possible, with the beam aimed seaward toward a DX continent. Those lucky enough to have such a location would no doubt have excellent results with a monopole LP having a 10 dB gain on 40m or 80m. One aimed across a lake might also be good.

A vertical monopole for both 40m and 80m of the "skip band" type is not out of reason, but would require at least 45.73m (150') in length by 42.68m (140') or 6,042.44m² (21,000 sq. feet) of open space, which is quite an area unless you are lucky enough to live on a ranch or farm.

Next time, we'll get into the step-by-step procedure for assembling simple, inexpensive 2:1 bandwidth DLPs for 20-15-10m, single band LPs for 40m or 20m, and 40m or 80m vertical monopoles. 73

CALENDAR EVENTS

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Television Society will hold its BRATS Maryland Hamfest and Computer Fest on Sunday, July 27th, at the Timonium Fairgrounds, York Rd. off I-695, I-83. Directions: Take I-695 (the Baltimore Beltway) to Exit 24 (I-83 North). From I-83, take Exit 17 (Padonia Rd. East), then turn right at the 3rd traffic light onto York Rd. Continue south on York Rd. to the Fairgrounds entrance. You can also take the MTA Light Rail to the Timonium Park & Ride stop, or park in the Timonium Park & Ride lot on Deereco Rd. Talk-in on the 147.03(+), 145.13(+), 224.96 and 448.325 MHz rpters. Grounds open for tailgating at 6 a.m. Building opens at 8 a.m. Accessible to the handicapped. Vendors can setup beginning at 2 p.m. on Saturday. Admission is \$6 per adult, children under 12 free. Tailgating spaces are \$10 each, first come, first served. No advance reservations for tailgating spaces. VE exams will be given at 9 a.m. only; check-in is at 8:30. Pre-registration is required. To pre-register call John Creel WB3GXW at 301-572-5124, after 6 p.m. For further info see the Web page at [<http://www.bratsatv.org>]; E-mail [hamfest@bratsatv.org]; call or fax 410-461-0086; or write BRATS Hamfest, P.O. Box 5915, Baltimore MD 21282-5915.

AUG 2

ALFARATA, PA Juniata Valley ARC Hamfest, 6:30 a.m. General admission, 8:00 a.m. Morning and noon food items available.

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MUFs, LUFs, and SIDs

Solar activity will range from quiet to active in June but no major geomagnetic storms are expected. Aside from seasonal limitations, propagation throughout the first half of the month should provide some excellent DX opportunities.

The first five days should be especially good, although coronal hole effects may tend to dim this outlook somewhat. Only three days out of the first two weeks are forecast to be duds. In contrast, generally fair to poor conditions will prevail during the second half of June, although the 19th–20th and 29th–30th have the potential to be the best propagation days of the month. The worst period will be from the 22nd through 28th, with the greatest solar activity occurring on the 24th, 25th, and 26th.

We are now in the summer “doldrums,” where strong ionization puts a damper on daytime HF communications, so this is a good time to review the concept of Maximum and Lowest Usable Frequencies (MUFs and LUFs) and how they affect us. The MUF is the highest frequency that can be adequately reflected back to Earth and the LUF is the minimum frequency that can overcome atmospheric attenuation. The MUF for a given distance is basically controlled by the angle of reflection (determined by the condition and height of the “F” layers of the ionosphere), while the LUF is determined by the amount of attenuation caused by the “D” layer. As the frequency is reduced, the losses from the “D” layer increase, and at some point the signal becomes lost in the background “noise.” Since “D” layer absorption is at its greatest during the summer, LUFs rise to their highest values of the year. When the LUF is equal to or greater than the MUF, there is a “black-out” and communications become very difficult, if not impossible, to maintain. Sudden Ionospheric Disturbances (SIDs) due to solar flares add significantly to “D” layer absorption and often trigger such blackouts.

How do we work around these problems? The most obvious is to operate during the early and late parts of the day, at night,

June 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
1 G	2 G	3 G	4 G	5 F-G	6 F	7 G
8 F-G	9 F-P	10 F-P	11 F-P	12 G	13 G	14 F-G
15 F	16 F	17 F-P	18 F	19 VG	20 G	21 F-G
22 F-P	23 F-P	24 P	25 P	26 P	27 F-P	28 F-P
29 G	30 VG					

EASTERN UNITED STATES TO:												
GMTs	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15-20	(15-40)	20 (40)	20 (40)	(20)	(20)	(15-20)	15 (20)	15 (20)	15 (20)	10-20	(12) 20
South America	15-20	(15)	(15) 20	(20-30)	x	(20)	(15-20)	(15)	(15)	(10-15)	10 (20)	(10) 20
Western Europe	20 (40)	20-40	(20-40)	(20-40)	20	(20)	(15-17)	(15)	x	(15-20)	(15) 20	(17) 20
Southern Europe	(40)	(40)	20	20	x	x	x	(12) 15	(15)	(20)	(20)	x
Africa	20 (30)	20 (40)	(20-30)	x	x	x	x	x	x	(15-20)	(12) 20	(17) 20
Eastern Europe	20 (40)	20 (40)	(20-30)	x	x	(20)	x	x	(15)	(15-20)	15-20	(15) 20
Middle East	20 (40)	20 (40)	(20-30)	x	x	(20)	x	x	(15)	(15-20)	15-20	(15) 20
India/Pakistan	(15-20)	(20)	x	x	(20)	x	x	x	x	x	x	(15)
Far East	x	x	x	x	x	(20)	(20)	x	x	x	x	(15)
Japan	x	x	x	x	x	(20)	(20)	x	x	x	x	(15)
Southeast Asia	(15-20)	x	(20)	x	x	(20)	x	x	x	x	x	(15-20)
Australia	15	(15)	15 (20)	20 (30)	(20-40)	(20)	(17) 20	(20)	x	x	x	(15)
Alaska	(15)	(20)	(20)	(20)	(20)	(20)	(20)	x	x	x	(15)	(15)
Hawaii	15 (20)	(15) 20	20 (30)	20 (30)	20 (30)	(20-30)	(20)	x	x	x	(15)	(10-15)
Western USA	(12) 20	(12) 40	(20-40)	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20
CENTRAL UNITED STATES TO:												
GMTs	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15-20	(15) 20	20 (40)	20 (40)	(20)	20 (40)	20	(15) 20	15 (20)	(10-20)	10 (20)	(10) 20
South America	10-20	(12) 20	(15-40)	(20-40)	x	(20)	(20)	(15)	x	(10-12)	(10-15)	10 (20)
Western Europe	(17) 20	20 (30)	20 (40)	(40)	x	(20)	(20)	x	x	x	x	(15) 20
Southern Europe	x	x	(30-40)	(20)	x	x	x	(15)	(15)	(20)	(20)	x
Africa	20	20 (40)	(20-30)	(20)	x	(20)	(20)	x	x	(15)	(15-20)	(20)
Eastern Europe	20	20 (40)	(20-30)	(20)	x	(20)	(20)	x	x	(15)	(15-20)	(20)
Middle East	(17) 20	20 (40)	(20-30)	x	x	x	(20)	x	x	x	(15)	(15-20)
India/Pakistan	(15-20)	(15-20)	(20)	(20)	(20)	(20)	x	x	x	x	x	x
Far East	(15)	(15)	(15)	x	(20)	(20-40)	20 (30)	(17) 20	(20)	x	x	x
Japan	(15)	(15)	(15)	x	(20)	(20-40)	20 (30)	(17) 20	(20)	x	x	x
Southeast Asia	(15)	(15)	(20)	(20)	(20)	(20)	(20)	x	x	x	x	x
Australia	(15)	15	(15-20)	20 (30)	20 (40)	(20-40)	20 (40)	20	x	x	(15)	x
Alaska	(15-17)	15 (17)	(15) 17	(20)	(20-30)	(20-40)	20 (30)	(20)	x	x	(15)	x
Hawaii	(10-20)	15 (20)	(15) 20	20	20 (40)	(20-40)	20 (30)	(20)	x	x	(15)	x
Western USA	(12) 20	(12) 40	(20-40)	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20
WESTERN UNITED STATES TO:												
GMTs	00	02	04	06	08	10	12	14	16	18	20	22
Central America	(12) 20	(15) 20	20 (30)	20 (40)	(20-30)	(20-40)	(20-30)	20	(15-20)	(10-17)	(10-20)	(10-20)
South America	12 (20)	(12) 20	(15) 20	(17) 20	(20-40)	(20)	(20-30)	(15-20)	x	x	(10-15)	(10-15)
Western Europe	(17) 20	20	20	(20)	x	x	x	(20)	(15-17)	(15)	x	(15-17)
Southern Europe	x	x	x	(20)	(20)	x	x	(20)	(17-20)	(15-17)	x	x
Africa	x	x	x	(20)	(20)	x	x	(20)	(17-20)	(15-17)	x	x
Eastern Europe	x	x	20 (30)	(20)	x	x	x	x	x	x	x	x
Middle East	(20)	(20)	(17) 20	(20)	x	x	x	x	(15)	x	x	x
India/Pakistan	x	x	(15)	x	x	x	(20)	(20)	(20)	(15-17)	x	x
Far East	(15)	x	(20)	(17) 20	20	20 (40)	(20-40)	20 (30)	(17) 20	(15-20)	x	15
Japan	(15)	x	(20)	(17) 20	20	20 (40)	(20-40)	20 (30)	(17) 20	(15-20)	x	15
Southeast Asia	x	x	(15)	x	(20)	(20-30)	(20-30)	20 (30)	(17) 20	(17-20)	x	x
Australia	(10-15)	(10) 15	(12) 15	(15-20)	20	20 (40)	20-40	(17) 20	x	x	(12-15)	(12-15)
Alaska	(12-15)	(12-15)	(15-20)	(17-20)	20 (30)	(20-30)	(20-40)	20 (30)	(20)	(17)	x	(15)
Hawaii	(10-15)	(10) 15	(12) 15	(15-20)	20-40	(20) 40	(20) 40	20 (30)	(20)	x	x	(15)
Western USA	(12) 20	(12) 40	(20) 40	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

and on the highest frequencies possible. Morning and evening gray-line propagation can be very effective if you are able to reach areas of the world that interest you. If you have the power to increase gain by 10 dB for each 2 MHz reduction in frequency, you can often operate below the LUF. Sporadic-E (touched upon last month) can be another interesting avenue of investigation if you have the time and patience to watch for it. Finally, propagation analysis programs are indispensable tools for determining MUF/LUF values for a particular circuit. "MINIMUF," "MICROMUF," "WINCAP," "VOACAP," and "CAPMAN" are a few of the popularly used titles. NB6Z maintains a Web site with links to many useful on-line propagation tools. See [http://home.teleport.com/~nb6z/solar.htm].

73 and happy hunting!

Band-by-Band Forecast

10–12 meters. Openings on ten and twelve are limited, but there should still be regular opportunities into the Caribbean and Latin or South America from mid-afternoon through early evening. Eastern Europe and the Middle East might open up just after sunrise, and Japan, Australia, or the Far East may be open in the early evening. Daytime short-skip can range from 1,000 to about 2,000 miles.

15–17 meters. Some good opportunities can still be found in many areas of the world, but these will diminish as the month progresses. Openings will begin about an hour after sunrise and should last until nearly midnight. Central and South America will be quite reliable for a good part of the day while the western Pacific, from the Aleutians down to Australia, should supply regular openings around mid-evening. Short-skip will average between 1,000 and 2,000 miles.

20 meters. Around-the-clock opportunities will be available on Good (G) days. Decent opportunities will often be found right after sunrise and late in the afternoon, but the evening hours after sunset will be the best time for strong propagation. Supertime through late evening should support regular pipelines to Europe and the Middle East, but you'll only find "night owls" awake over there at those hours. If you find yourself awake between midnight and sunrise, try working the central or western Pacific, where openings should be regular and strong. Short-skip will fluctuate between 500 and 2,200 miles.

30–40 meters. Atmospheric noise due to convective storms will play the major role in daily conditions, but there should be lots

of activity here during the quieter periods. Good opportunities to Europe, the Middle East, and Africa will be available to stations located in the eastern U.S., while Australia, Japan, and the Far East will be open to those in the western states. If you live in the central U.S., then all of these regions should be available to you at some time during the month. As usual, Central and South America and the Caribbean will be open to everyone on most days. Short-skip at night will range from 500 to 2,500 miles but will be well under 1,000 miles during the day.

80–160 meters. Propagation on these bands will be spotty due to high QRN levels, but decent opportunities can still be found at night during the quieter periods. Let forty meters be your guide. Eighty and 160-sixty are pretty much nighttime-only bands with short-skip ranging from 1,000 to 2,000 miles, but daytime multiskip is possible into the Caribbean and northern South America. Noise levels are bound to be very high on most days, however, and daytime short-skip will typically fall under 300 miles. 73

CALENDAR EVENTS

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Admission \$2.00 donation, XYL and children free. Tailgating \$5.00 donation, includes admission. Indoor tables, \$10.00 donation per table. Space is limited. Vendors responsible to collect PA sales tax. Electricity, \$2.00 additional. Please bring your own power cords. Directions: The Decatur Fire Co. is located along US Route 522 North, 8 miles east of Lewistown, PA in the town of Alfarata, PA. Look for signs. Talk-in on 146.910 MHz. For more info, contact JVARC, PO Box 73 Yeagertown PA 17099, or contact Cliff Bell WB3IVX, 717 248 2616.

SEP 25–28

SEATTLE WA Microwave Update 2003 organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25–28, 2003. Registrations for the joint conference will be accepted beginning April 1st. Cost of the registration will be \$40 prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be \$50. Registration forms can be downloaded at [www.microwaveupdate.org] or send an SASE to John Price N7MWV, 12026 81st Ave. NE, Kirkland WA 98034, and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to *Microwave Update 2003*. Joint conference

sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are \$69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at 425-337-2900. Be sure to mention "Microwave Update" to get this rate. Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to Jim Christiansen K7ND, via E-mail at [k7nd@att.net]. MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to NU7Z [nu7z@aol.com]. For presentations at the Pacific Northwest VHF Conference sessions, contact N7CFO at [n7cfo@ix.netcom.com]. LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice. 73

THE DIGITAL PORT

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good) check out the 1st Page 2000. Very satisfactory for just about any purpose I can imagine. It is available for download from [www.evrsoft.com/].

That's it for this month. I need to stop and get my digital operating "fix." See you out there. 73. Jack KB7NO [KB7NO@att.net]. 73

HOMING IN

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will be up to \$1,200 for units with built-in GPS and as low as \$500 for non-GPS units. NOAA knows that more beacons mean more false alarms, but the requirement for 406 MHz digital ID will at least tell them who's transmitting, making it easier and faster to deal with them. NOAA

is so confident about this that plans are in the works to discontinue satellite tracking of anonymous 121.5 MHz alerts by 2009.

Do these new rules mean more opportunities for search and rescue support by hams? Only time will tell. Meanwhile, I want to hear about your experiences in searches for ELTs, EPIRBs, and PLBs. Send stories and photos via the Internet or the Post Office to the addresses at the beginning of this article.

Notes

1. "Homing In: Wildlife Tracking Update — Burrowing Owls Found, Saw-whets Sought," *73 Magazine*, October 2001.
2. "Homing In: Squegging — Now It Helps Us Track the Birds," *73 Magazine*, January 2003.
3. [www.batcon.org].
4. "Homing In: Two New Tools for T-Hunting," *73 Magazine*, April 2003.
5. Moell and Curlee. *Transmitter Hunting — Radio Direction Finding Simplified*, published by TAB McGraw-Hill, ISBN 0-8306-2701-4. Chapter 23 has a detailed description of SARSAT/COSPAS technology.
6. "Homing In: T-Hunters to the Rescue," *73 Magazine*, April 1994. 73

LETTERS

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complex each week. My wife plays the lessons at the same time each day, and the baby gives her reminder kicks about half an hour before each lesson.

We'd never have done these things without you. My former-vegetarian wife is even eating salmon to increase her DHA levels, thanks to Uncle Wayne. Oh, and the baby gets a literal kick out of Mozart's last four symphonies. Your recommended CD guide is astonishingly good! We can't wait to apply the lessons we're learning from Baby Signs and Joan Beck's book ... and then come the music lessons, foreign language immersion, speed reading. ... I think our kids are going to be enormously grateful to you! 73

NEVER SAY DIE

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Coach-Class Syndrome

In a past editorial, I wrote about how Continental Airlines almost killed me on a trip to Lisbon. The June 27th issue of

the *Wall Street Journal* had a front page article on what they've termed the Coach-Class Syndrome. Some of the airlines are beginning to warn passengers about this problem.

When I arrived in Lisbon, after a couple hours of uncomfortable sleep, jammed into the coach-class seat with almost no leg room, my right leg was totally numb, except for a whole lot of pain. The sharp front edge of the seat cushion had cut off the blood circulation to the leg and a blood clot had formed. It took two days of great pain before I was able to hobble around, totally ruining my visit to Lisbon.

I was lucky. It took the death of Emma Christofferson, returning to London from Australia, to get the attention of the media. Emma, 28, was an active skier and in perfect health. A blood clot had formed in one leg and gone to her heart. Blotto.

A medical journal on the subject said that over 800,000 airline passengers have had to be hospitalized for this deep-vein thrombosis (DVT) after long flights. I really should have opted for a hospital, but I didn't know any better. Some aspirin could have helped thin my blood, returning circulation faster.

Now some of the airlines are warning passengers to get up and move around the cabin every hour, to drink plenty of liquids, and avoid any alcoholic or caffeinated drinks, since they dehydrate you. The very dry air in planes makes dehydration a particular problem.

Hey, guys, how about changing your seat design?

Still Another Poison

Yep, something more to worry about. It's no wonder, according to the AMA, that only 1.6% of Americans are truly healthy. It's plastics (again). That clear plastic wrap we use for foods, it turns out, outgases into the wrapped food, and from there into us. The really bad news is that the toxic chemicals involved look to our bodies like estrogen, and elevated estrogen levels create a whole raft of troubles — like prostate, breast cancers, and uterine fibroid tumors.

No, you don't want to substitute aluminum foil. How about going back to waxed paper?

Unlike our grandparents, we're being bombarded with estrogen in our eggs, milk, cheese, butter, yogurt, meat and poultry. They're all laced with trace amounts as a result of the steroids pumped into young cows and poultry via their feed or injections to fatten them up so they'll be better egg layers, milk or meat producers. Organic meat, dairy, and poultry don't have these

toxins, if you can find 'em. Since reading Robert Cohen's *Milk, The Deadly Poison*, I've stopped drinking milk. I'm still using butter and yogurt, but you can be sure that I'm only buying the packages with the "organic" label. I want as much of the food I eat as possible not laced with pesticides, growth hormones, estrogen, and antibiotics.

The Fiend

When I was a kid anyone who was into photography was a "camera fiend." Hams were "radio fiends." The fiend term dropped out of use, replaced by "nut," as in camera nut or radio nut. So I've graduated from being a fiend to a nut.

The terms were applied to anyone who was seriously into anything — anyone who is different. Golf nuts, sports car nuts, crossword puzzle nuts, health nuts, and so on.

Having been an only child, I was brought up by and with adults, so I never got the hang of this kid peer-pressure thing. Still haven't. When I got to my teens and the other kids were smoking I tried it and said yuuuck. That was before the big health brou-ha-ha over cigarettes. My father smoked, and so did everyone else in my family.

When I dutifully went off to college (I didn't know any better then) and joined a fraternity, beer drinking was the big deal. They had weekend parties where my fraternity brothers would drink beer until they puked, and then drink more. I tried beer. Ugh. Phooey, again. And this despite everyone in my family drinking. Heck, during Prohibition my dad had a bar in the cellar where he entertained his aviator friends — like Amelia Earhart. Everyone in those days smoked and drank. But me. I wasn't righteous about it. I wasn't worried about my health, I just didn't like the taste, case closed.

I'm still marching to my own drum, and the hell with peer pressure.

And this holds for my essays, too. I'm no more swayed by the general public's CW (Conventional Wisdom) than I am the CW fiends in Newtonington who have almost killed our beloved hobby. As I've been saying in my editorials for the last 50 years, I do my homework carefully before I write — but, if you have data that I haven't found that has led you to another conclusion, please let me know what I've missed. I've insisted that it be information, not an emotional belief that you want me to share.

This attitude has naturally alienated a lot of readers — because I've researched and written about many controversial

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Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$10 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively — once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines). Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories — where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready. how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 7.3: Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

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Colloid Clips: Three 9V battery clips, 2 alligator clips & instructions. \$5 (#99)

AC-powered Colloid Kit: 12V power supply, silver wires, reprint, including priority mail shipment. \$37 (#82)

Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry; Schools in 2020: another \$ trillion industry. Anthrax, a simple cure. Dowsing: why and how it works. \$3 (#86)

My 1992 We The People Declare War! On Our Lousy Government book—360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs — such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was \$7. I found a few in the warehouse. \$3, while they last. Great book! (#83)

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NEVER SAY DIE

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subjects — subjects where belief systems are deeply indoctrinated.

When I write that things like dowsing, remote viewing, precognition, psychokinesis, past lives, and so on are real, it's much easier to slough me off as a nut than to do some reading to find out if I know what I'm talking about.

I've been writing about NASA faking the Moon landings. We saw and believed what we were seeing and being told. We all wanted so much to believe in America's great achievement that the voices of the few skeptics were drowned out. When René sent me a copy of his *NASA Mooned America*, which was obviously a self-published book, I laughed at the whole idea. I get a lot of conspiracy-theory books like that — full of speculation and short on reliable references. But René was citing facts and he had clear color NASA photos which, once I looked at them critically, backed up René.

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Smart Guy, Eh?

Could you pass a 1940 test? Here are a few questions and answers from one.

Ques: Why is full-wave rectification generally preferable to half-wave in a power supply?

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Wise Up & Beat the Odds

NEVER SAY DIE

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New Blood

Here we are with our hobby gradually fading away ... with the Silent Key list longer than the new licenses list. We need to get our act together and get some youngsters interested. (a) What have we got to offer that's more fun than the Internet? (b) If we do come up with a message, how can we get it to the youngsters? Please advise.

We'd better hurry because the Internet is offering more and more action ... and we aren't.

The Feynman Syndrome

If you haven't yet read *Surely You're Joking, Mr. Feynman — Adventures of a Curious Character*, then you've got a wonderful surprise in store for you. Nova did a great program on Nobel prize-winning physicist Feynman. There's even a CD out of Feynman telling about his "safecracking" days at Los Alamos. Spring the \$10 for the book.

What he did at Los Alamos is discover how easily the file cabinets locking the top-secret atom bomb research files could be broken into. He tried to get the bureaucrats running the place to get better locks by showing them how easy it was for him to get into the file cabinets. The bureaucratic response was not to improve the locks, but to prohibit Feynman from getting near the files.

Alas, that syndrome came to mind when I was thinking about the problems facing

RPI (Rensselaer Polytechnic Institute). I was such an itch about the need to improve their School of Management and make its MBA program more competitive with other schools that Bob Hawkins, the dean, finally threw me off the School of Management Board of Overseers. And since I'm a similar pest when it comes to the rest of RPI, I wouldn't have been surprised if my RPI Council membership had been terminated ... instead, the RPI Council was terminated.

The problem is mostly me, I admit it. But I don't have a clue as to what I can do about it. Most people see things going wrong and are either pliant or politick enough to keep quiet and let things be. Through either some defective DNA inherited from a smoking and drinking father, which was guaranteed to cause genetic mischief anyway, or through some dreadful failure in my education, I've turned out to be one of those bothersome people who not only call a spade a spade, but are dumb enough to speak up and say so out loud. The king has no damned clothes.

For instance, a few years ago New Hampshire Governor Judd Gregg asked me to serve on an Economic Development Commission. The problem was that our state had been hit the worst of all 50 states by the recession and the governor and the legislature were looking for some guidance on both short- and long-range plans for solving the problem.

There were 32 of us appointed to the commission ... about half businesspeople. By nine months later over half had dropped out, and the commission faded away without ever even submitting a report. It did not fade silently away because I was raising hell with the commission members every inch of the way.

Early on, I saw that the meetings weren't getting anywhere. There was no way for 32 people to discuss the problems facing New Hampshire and come up with proposed solutions. The meetings were a shambles, so I decided to get as much information from the meetings as I could, then do my homework by reading the recommended books and interviewing experts. I put all the information I discovered together and started sending the commission members reports on what I'd found, along with ideas for solving the problems.

I pointed out exactly why New Hampshire had been hit so hard by the recession and why, unless some major changes were made by the legislature, we weren't apt to be able to recover quickly. I looked into the rising unemployment and came up with some proposals for creating thousands of new jobs. After hearing testimony from the presidents of our major colleges and other key educators, I pointed out that if New Hampshire was going to produce the technically educated workforce the 21st century would demand, we'd have to make some big changes in our school system.

A few books and several file drawers of reports from educators later, I had a good grasp of what needed to be changed to improve our school system and proposed this in my reports.

I researched crime, drugs, our prison system, welfare, health care, and so on, and came up with creative solutions to our problems in my reports. The response from the commission members? Many of them didn't "have time" to read my reports. Others were supportive, but not enough to actually get anything changed.

Does any of this resonate with your business, or what you see going on with our government? If so, do your homework, propose changes and stick to your guns.

As George Bernard Shaw said, "The reasonable man adapts himself to the world, the unreasonable one insists on trying to adapt the world to himself. Therefore, all progress depends on the unreasonable man."

Remote Viewing

Whazzit, remote viewing? It's being able to see something in your mind that's somewhere else or even sometime else. If you've been listening to the Coast to Coast AM (C2C) show you've frequently heard Ed Dames (a.k.a. Ed Dooms for his endless predictions of coming disasters), who sells courses in remote viewing.

As I mentioned last month, during his most recent appearance on the show he predicted

that Kim Song II would set off a nuke in the DMZ in order to blow a few thousand American troops to smithereens. Oh, and he confirmed that we'll be having a pole shift soon, which will wipe out much of humanity. Well, heck, maybe it's time for a fresh start. Things are getting onto hand when we have two-way radio wrist watches à la Dick Tracy, global positioning watches, and so on. My new watch has a picture of Krusty the Clown and says, "Hey kids, it's story time!" when I push a button. Well, I got tired of my calculator watch that corrected itself every morning via a signal from Colorado. And the two-way radio watches are still a bit bulky for other than shopping trips. They're the only way I can find Sherry once we get into a store. Well, you know how huge some supermarkets, BJ's, and Borders have gotten.

Oh, remote viewing. Yes. Sherry woke up one night when Ed Dames was explaining about remote viewing. When he mentioned that it could be used to predict lottery numbers it was only a matter of hours before Sherry had signed us up for a weekend remote viewing class in Las Vegas, complete with airline, hotel, and rental car arrangements. I'm pretty good at this psychic stuff, so why not? Besides, it would give me an opportunity to visit Art Bell again and see how he's doing since he retired from the C2C show last December.

We got to Vegas Friday evening, drove an hour to Pahrump, had dinner with Art, and visited his FM station (KNYE), which is totally automated. That's right, no staff. None. He can even program it from home, a few miles away across town. Then, back to his house and on 75m until 1 a.m.

One of the first to call in was W6BMG, Walt Zuckerman. I used to visit him when he was W2LBF, three blocks from me in Brooklyn. We used to have a ball on 160m working full duplex with five or six other locals. That was 65 years ago, shortly before I got my ticket.

At the conference the next morning Ed and "FM" explained about the remote viewing protocols and started the group ... about 30 of us ... trying to figure out what the picture they had in a sealed envelope might be. I got an impression of some towers, water and rocks. It turned out to be a picture of the Golden Gate Bridge, with two big towers, rocks in the foreground, and water under the bridge. Hmm. Not a big win, but not a total loss.

I got some fairly close impressions on a couple of other tries, and total losses on some. I need more practice.

On the downside, if remote viewing really does work, how come they're offering \$25 million to find Osama and no one is stepping forward? Maybe if they offered it tax-free?

And all that mystery about Saddam's being alive or not? I guess the government stopped using RVer's to find stuff like that.

Since Sherry and I were going to be taking a class in PhotoReading the next weekend in Boston. I thought it would be nice to get good at RVing and PhotoReading so I could sit back at home and browse through the books I wanted to read in the Library of Congress ... without having to go to Washington to do it. When I was living in Washington seventy years ago, I spent a lot of time reading books in the Library of Congress. In those days a taxi ride anywhere in town was a quarter, so it was easy to get there ... even for a kid.

I was disappointed in the PhotoReading course. I'll tell you more about that after I've cooled off.

Adam Osborne

On our flight to Las Vegas for the remote viewing course put on by Ed Dames, Sherry and I got to talking about the old days and Adam Osborne. Neither of us had thought about Adam in years. A few minutes later I pulled out my copy of *Time* and started reading ... and there was an obit for Adam, aged 64, dead

after a series of strokes. A coincidence ... of course.

Adam got started in the business with a series of microcomputer books. He organized a computer conference in Paris, where I addressed the group on the current state of the art. In 1981 he brought out the first portable computer. At 24 lbs., it was an arm-stretcher.

The microcomputer revolutionaries are disappearing. Les Soloman died last year, now Adam Osborne. And I haven't had any answers to letters to old friends George Morrow or Bill Godbout.

Education?

Okay, I give up ... what are they teaching in our schools? We know that colleges are having to spend millions on remedial reading, writing, and math courses. 29% of the freshmen at four-year colleges have to have this. It's 41% at two-year collegettes. That's right, almost half the high school graduates have gotten a really bum start in life.

A recent international test of Americans 18-24 found that 30% could not find the Pacific Ocean on a world map. 56% were unable to find India. Heck, 11% couldn't find the US on a map. 58% couldn't find Japan, 65% France, 69% the United Kingdom. Sigh. Less than 15% could locate Israel or Iraq. One third put the US population between one and two billion.

It's taking students five and six years to graduate from four-year colleges. Only 31% make it in four years at state institutions! When Pennsylvania last year promised \$6 million bonuses to state colleges that graduated at least 40% of their in-state students within four years, not one college made it.

So, our school system has been getting worse and worse while it's been getting more and more expensive. So? You have a choice of the "what can I do about all this?" route ... the "how can you fight city hall?" syndrome ... or to decide that heck, someone

really ought to DO something about this government-run mess we've let get messier.

Well, there's this geezer in New Hampshire who says he knows how we can fix all this and give our kids a better chance to compete with the rest of the world by growing a new technology (distance learning via DVDs) into a big industry. And that takes a magazine, just like personal computers, cell phones, and compact discs did.

Or you can shrug and reach for the remote control while our kids are running up an average of \$19,400 in student loan debt, plus losing the wages they'd have made if they were working, making each of those two added years cost either them or their parents about \$50,000.

I haven't made any secret that I consider the whole concept of high school, college, and then getting a job to be a giant con job. I wrote my first book on that subject 40 years ago. Well, I didn't know any better, and neither did my dad. WWI came along when he was college-age, so he went to New York Military Academy and graduated into the Army Air Corps ... and afterwards a career in aviation.

The alternative (for any newcomers to my stuff) is to go the medieval apprentice route and learn a trade. No, I don't mean plumbing or carpentry. The career road to freedom and money, I preach, is to pick some field that is so much fun that you feel like you are cheating, get a job with some small company in that field, and then spend the next year or two learning everything about it. Get someone else to pay you to learn everything you need to know to run a small business. Oh, and keep your imagination peeled for any need of new products or services in that field. The gory details are in my *\$5 Secret Guide to Wealth* book.

But we still need to provide an alternative for our public schools and colleges ... provide the education kids need

Continued on page 8

continued from page 1

Ans: A full-wave rectifier supplies twice as many pulses per second to the filter for a given supply frequency, and therefore is easier to filter and provides better voltage regulation.

Ques: What undesirable effects result from frequency modulation of an amplitude-modulated carrier wave?

Ans: Spurious signals that occupy a wide band of frequencies and cause unnecessary interference may be transmitted.

Ques: Draw a schematic diagram of a filter for reducing amateur interference to a broadcast reception consisting of a series-tuned circuit connected in shunt with the BC receiver.

Ans: See Fig. 1.

Taken from *The Modulator, the news and views of the Fort Myers Amateur Radio Club, Inc., March 2003, which gives credit to a sample test found in the 1940 (seventh) edition of the Radio Handbook.*

Mil Freqs

Want to listen in on military frequencies?

Here are the top 49, courtesy of Ron KOOZ.

1. Air Force GHFS primary days — 11.175 USB
2. Air Force GHFS primary nights — 6.739 USB
3. Air force GHFS — 4.725 USB
4. Air Force GHFS — 8.993 USB
5. Air Combat Command (ACC) ops. — 9.014 USB
6. STRATCOM primary days — 11.243 USB
7. STRATCOM primary nights — 6.761 USB
8. MYSTIC STAR primary AF-1/AF-2 SAMs — 6.812 USB
9. Air Force GHFS McClellan/MacDill AFB — 11.246 USB
10. Air Force GHFS (old SAC S-394) — 13.201 USB
11. Air Force GHFS Andrews/MacDill AFB — 13.215 USB
12. Air Force GHFS — 13.244 USB
13. Search & Rescue, all military — 5.680 USB
14. Primary USCG aviation (nights) — 5.696 USB
15. USCG (primary days) secondary nights — 8.984 USB
16. U.S. Navy HICOM — 6.697 USB
17. U.S. Navy HICOM — 11.267 USB
18. NORAD primary nights — 9.023 USB

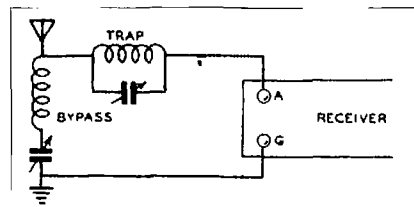


Fig. 1. Answer to 1940 test question.

19. STRATCOM (old SAC) — 13.241 USB
 20. STRATCOM Sierra 302 — 3.113 USB
 21. STRATCOM — 13.205 USB
 22. STRATCOM X-Ray 906 — 13.217 USB
 23. Mystic Star/Andrews AFB/STRATCOM — 13.247 USB
 24. ACC (2nd) tactical ops. — 15.091 USB
 25. STRATCOM Alpha Sierra — 3.369 USB
 26. STRATCOM Sierra 304 — 4.495 USB
 27. Mystic Star / Andrews AFB — 4.721 USB
 28. Air Force GHFS (discrete) — 18.002 USB
 29. Air Force GHFS — 18.046 USB
 30. STRATCOM Foxtrot — 5.020 USB
 31. STRATCOM (discrete) — 17.972 USB
 32. Air Force GHFS — 17.975 USB
 33. STRATCOM (old SAC Whiskey) — 20.631 USB
 34. ACC tactical (old SAC Charlie Alpha) — 20.846 USB
 35. Navy anti submarine warfare ops. — 8.872 USB
 36. Air Mobility Command (AMC) ops. — 5.197 USB
 37. AMC ops. — 18.027 USB
 38. NORAD — 11.214 USB
 39. NORAD — 5.297 USB
 40. NORAD — 9.793 USB
 41. NORAD — 10.194 USB
 42. NORAD — 10.452 USB
 43. STRATCOM — 5.328 USB
 44. NORAD — 11.441 USB
 45. NORAD — 14.364 USB
 46. NORAD — 20.855 USB
 47. STRATCOM Papa 382 — 5.826 USB
 48. STRATCOM Golf — 6.826 USB
 49. STRATCOM X-ray-Yankee — 7.330 USB
- From GARBLE, the monthly publication of the St. Charles Amateur Radio Club, Inc., April 2003.

Are You an Old-timer?

How many of these items do you remember or have you used?

Do you remember the SKY BUDDY or maybe the SKY-RIDER SX-28? How about RCA's AR-77 receiver?

Have you ever called CO using a Johnson RANGER, or perhaps even the little ADVENTURER?

Have you ever built a HEATH-KIT? Or even further back, a STANCOR KIT?

Did you ever order anything from the ALLIED CATALOG, or maybe LAFAYETTE RADIO? Did you ever buy any gear from HENRY RADIO in Missouri?

Did you ever call your antenna an "AERIAL"? Ever build a crystal set? How about a regenerative receiver?

Let's go way back. How about an AUDION PANEL, or perhaps a VARIOMETER? Or perhaps a detector tube.

Remember TUBES? Did you ever enjoy an 807?

Ever use Q-signals? National Radios? Remember when you would have killed for an HRO? Or an RME?

Many hams had an HQ-129X. I did. Of course, everyone wanted a COLLINS. Any one. It didn't make any difference.

Remember plug-in xtals? How about ASTATIC mikes?

Bugs? All kinds of them. Remember when you had to keep a log?

Remember when CQ was 35 cents and gas was 20 cents a gallon?

Remember when 73 Magazine first came out? It cost 37 cents.

Remember when most people didn't know what a "HAM" was? They either thought we were nuts or held us in utter awe.

Nice, wasn't it? Take you back???

Thanks to the March 2003 issue of The Modulator.

Harvey Honors Hams

Radio commentator Paul Harvey chose Wednesday, March 19, to honor ham radio. In his broadcast, Harvey described radio amateurs as America's quiet warriors. He said that there are 700,000 of them who are unpaid, uncelebrated, civilian radio operators, who are there during and after floods, fires, and tornadoes.

And, said Harvey, after the 9/11 attack hams were indispensable in reuniting families.

This was a very unexpected salute to the nation's ham radio community. You can find it on the Web at [www.paulharvey.com]. Look for the show dated March 19th.

Thanks to W6RCL, via Newsline, Bill Pasternak WA6ITF, editor.

Tube-Type PCs

It seems that a venerable old friend simply refuses to die the death of technical obsolescence. The vacuum tube continues its reemergence into the audio marketplace, this time — believe it or not — in personal computers.

The first tube motherboard appeared last year in response to PC gamers who craved the allegedly "more natural" sound produced by vacuum tube technology. Those who have seen the boards call it a strange sight to behold.

More on this May-December marriage of filament and silicon can be found at [www.neoseeker.com/Articles/Hardware/Reviews/aopenax4btube].

Thanks to CGC Communicator, Clayton Creekmore, and [www.neoseeker.com], via Newsline, Bill Pasternak WA6ITF, editor.

Say You Saw It in 73!

LETTERS

From the Ham Shack

Marcel Lemay VE7TSF. I read with interest your ideas about prison reform through self-sufficiency (January 03). Many years ago, through my employment, I was privileged to have conducted tour of all the federal prison facilities in and around Kingston, Ontario, Canada. As a civilian employee of the RCMP, I was responsible for all their radio communications facilities in most of the province of Ontario. As a result of a threat of strike by prison guards, my section was directed to do a communications survey of all seven federal penitentiaries in the area so that as required, the RCMP could move in and guard the prisoners complete with their own communications system. Unionized workers have been known to sabotage their equipment under such circumstances. It was during this survey that I observed the activities taking place in all the penitentiaries, be they minimum, medium, or maximum security. Each of the prisons had a specialty operation. One was dairy, another beef, another hydroponics, another general farming, another garden produce, or some combination. The system was such that for this area the prisons system could have been self-sufficient as far as food production was concerned except ... we were informed that through restrictions from various government marketing boards, local unions, and merchants, the local economy (merchants) might have suffered because of it. For this reason, the full potential of the farming activities could not be realized. This would also have helped reduce the cost to the taxpayer and provide the inmates a sense of accomplishment. It seems that the unions won out again. Keep up the fight. Wayne — we are with you.

Richard Appleyard VE3YAG/VEØRCN. Wayne, I have read your editorials over the years, and I'd just like to inform you that my daughter (13 years young) has attempted to build a regenerative receiver from 1924. With the schematic being 80 years old and tube technology, we required assistance from several hams to get the radio operational. The radio is for a school project. She did two speeches on her subject in her school and now goes to the next level of public speaking. The radio will be on display for another part, the competition. Will keep you informed on her status. After the competition she will be studying for a ham ticket to be able to work dear old Dad when he is away from home. My daughter is one person who does not back down from a challenge! She is involved in choirs, sports, sailing and studying diligently to achieve her dream of being a physician. Even our family physician, who is her role model, says she has every confidence in her achieving her goal. So now, when some kids are taking the easy way out, she is working at her goal.

Wayne, I got so tired of my physician browbeating me about my weight that I have lost 20 pounds by cutting in-between snacks and walking up to three miles a day three times a week, and you are right, there are many hams — myself included — who are overweight. If a person cannot walk too far then do a couple of blocks and forgo transportation if possible, and walk. It lets you see what a person missed behind the wheel of a vehicle. And take the HT for company — distance goes quicker when chatting and walking at a brisk pace of 2 mph.

Ray J. Howes G4OWY. At the last count, I had at least a dozen QRP rigs — all sizes, all descriptions, some of 'em home-brew, too! Clever, eh?

Anyway, in the light of Wayne's (editorial on the Planet X scenario, March 2003) exhortations to get our QRP rigs in good shape, perhaps I should pass on some of my surplus QRP transceivers (well, to be honest, they're not that surplus, but I'd like to do my bit, if only for the sake of amateur radio) to those not so fortunate as myself — just in case. Any takers?

Enjoyed reading the "Autobiography of Everyham," part 1 — roll on, part 2!

Stew Tannahill KB2VVB. Read your article in 73 concerning making your own QSL cards. I had similar interests to Steve KE8YN. My technique is a little different, so I thought I'd drop you a line and explain them. I used Avery Label-Pro software to design the whole card. Then printed the QSL cards on my old dot matrix printer with Avery postcard stock #4167. This card stock, believe it or not, is still available thru Office Max for about \$18 a box. This gives exactly the correct-size postcard.

While they are in b/w only, they are quite acceptable to hams in general. Got my DXCC, WAC, WAS with them.

I thought I would be changing my call early on, so I didn't want a batch of cards with the wrong call on them. That eventually changed. This prompted my ingenuity in designing the cards. Some of my friends liked them, so I did some for them.

NEUER SAY DIE

continued from page 2

and want, not what they're being force-fed today. And therein lies the beginnings of a new trillion-dollar industry.

All it will take, I believe, is a magazine to get this whole new industry launched. And that's going to take about a million dollars to get up and running. My business plan shows the publication breaking even in about three years, and by six, earning over \$3 million a month in profits. And double that a year later.

If you or someone you know has the money and an interest in totally changing

the world (for the better), a copy of my business plan can be had for \$100 plus a nondisclosure agreement (NDA).

Trivia

Walter Schiva KB6BKN sent me a couple copies of a free local publication packed with trivia stuff. Like? Like the annual defense budget for Andorra in the 1970s was \$4.90 — for blanks to fire on national holidays. And Mrs. Dorothy Edgers, an employee at the Office of Naval Intelligence who, on December 6, 1941, decoded a Japanese message that said Honolulu was to be attacked. Her

superior officer said the message needed more work and could wait until Monday. Or that the Germans during WWII painted their munitions factories with camouflage paint. Allied bombers then bombed only the camouflaged buildings.

Smallpox

They're telling us that smallpox is highly contagious and could spread rapidly, killing millions ... that smallpox can be spread by casual contact with an infected person ... that the death rate is thought to be 30% ... that there is no treatment for smallpox ... and that the

smallpox vaccine will protect us from getting the disease.

And we suckers are buying this hokum hook, line, and sinker. Well, those who haven't done any homework are. Those who have read Walene James's book (see the review on page 7 of my *Secret Guide to Wisdom*) know what a bunch of baloney we're being fed.

So why the massive disinformation barrage? Would you believe it has something to do with money, not public health or protection against a possible terrorist attack?

Smallpox is not highly contagious. It's spread mainly by bedbug bites. When's the last time you had a problem with bedbugs? In all my travels I've only encountered 'em once, at the Australia Hotel in Sydney. Oh, what a night that was! I moved to another room the next day.

The only people who have gotten really sick in the past were those who were already sick or badly malnourished, people with severely depressed immune systems. The death rate during some of the worst epidemics ran 4.2%, not 30%. The fact is that smallpox is one of the least virulent diseases.

So here we are, faced with our government about to force us to be vaccinated with a vaccine that does not prevent people from getting the disease, just makes them less sick if they do, and has a history of killing a small percentage inoculated, and making a substantial number sick.

Homework: [www.healingcelebrations.com]; [www.vaclib.com]; [www.allabout-smallpox.com].

Now you know why Indians were given blankets in order to give them smallpox so their land could be grabbed.

Today it's all about Wyeth Laboratories making billions selling their stores of smallpox vaccine.

The government has stockpiled 300 million doses. I wonder how much that cost us all?

80% of those vaccinated develop pustules which are extremely contagious for three weeks if not kept covered with a bandage. Rubbing the itching vaccination area and getting the pus into the eyes, ears, or nose can cause blindness, deafness, disfigured tissue, and even death.

Radar Jamming

Another million-dollar fraud! No, those passive radar jammers don't work. Even those costing over \$300 do not work. Check it out at radarbusters.com — radartest.com — troubleshooter.com — laseradar.com — radarone.com.

Alzheimer's

According to Dr. Fudenberg, the

world's leading immunologist, all it takes is five flu shots to increase your chances of getting Alzheimer's disease ten times higher than if you'd had no shots. It's the mercury (thimerosal) in every flu shot (and in many childhood shots) that goes to the brain and does the dirty work. Oh, plus mercury from amalgam fillings.

D.C. Schools

Maybe you read ... or heard on *60 Minutes* about the Washington public schools. They're spending \$10,500 a year per student, the second highest in the nation, with a student-teacher ratio of 15.8, so they should be some of the finest in the world.

At nine of the 19 high schools only 5% or less of the students are proficient in reading. In 11 of the high schools 5% or less of the students are proficient in math. Even worse, each year up to 96% are promoted to the next grade. This is a total fraud on the students and the public.

Yes, most of the students are black, but we have schools that are just as black in other cities which are honestly educating their students, and at a fraction of the cost.

Then we have New York City, where 60%-70% of the black and Hispanic kids are illiterate ... aimed at a life on welfare or in prison. And this despite the city spending \$11,128 per pupil! Despite flat enrollment the school system has added 13,000 more employees in the last seven years ... and still the kids are not learning to read.

Researchers claim that 90% could become literate if phonics were taught. In California reading scores have dramatically improved when phonics is taught. So why failure when success is so easy? Because failure means more government money.

Seed Licenses

The USDA is at it again ... with a plan to make it a federal law that farmers and gardeners who save seeds will have to have a license (\$100 minimum in California). The penalties are from \$1,000 for home gardeners to \$250,000 for nurseries. Also, gardeners must be able to prove that their cultivated plants are USDA-approved. This is going to make it more and more difficult to get non-genetic modified seeds.

The Salem Oregon City Council passed an ordinance limiting gardens to no more than a few hundred square feet.

And to think ... they're doing this "for our own good"! Oh, yeah? They're doing this for the good of the five largest seed companies. Money talks loud and clear.

Suckers

While reading an article by Dr. Tunsky it occurred to me (for the nth time) what suckers virtually 100% of Americans are. We are suckered into illiteracy and ignorance by our school system, which is terrible and getting worse. We're suckered into going to college for four to six years. Then we're suckered into finding a job, so we can support ourselves and our family ... instead of starting our own business.

We're suckered into believing that we can eat and drink anything legal. The great American diet makes us sick so we suckers go to a doctor instead of changing our diet. Never mind that two million Americans go to the hospital each year with adverse reactions to drug side effects, with ten percent of them dying. We get fat. We get heart disease ... 1.2 million die every year from this self-inflicted problem. We get cancer ... a half million die every year from this self-inflicted problem which has a 93% fatality rate. A quarter million die from diabetes ... also self-inflicted.

So we sit watching TV with a beer and chips. We wake up to a cup of coffee and Danish. We have a burger and fries for lunch, with a diet cola to watch those calories. We have a well-done steak and potatoes for dinner. We commute an hour to and from work. Oh, I forgot the morning and afternoon coffee breaks. There's some reason Starbucks is on every corner. And a Dunkin' Doughnuts in between.

Is it any wonder we have more doctors per capita ... one for every six citizens ... than any other country? That's big money in them golden medical hills. Or why our pharmaceutical industry is one of the most profitable in the world? It even beats out Microsoft!

Sugar

Dr. Perricone (*The Wrinkle Cure, The Perricone Prescription*) says, "Sugar causes inflammation, inflammation causes aging. Fifty percent of skin aging is the result of sugar. It's as bad for you as excessive sun exposure." He goes on to say that stuff like pasta, breads and potatoes rapidly raise blood sugar levels, leading to inflammation, wrinkles, and accelerating other disease processes.

Stress, too, is a bummer in that it kills brain cells, increases blood sugar levels and depresses the immune system.

My prescription for stress is a daily dose of classical music. Hey, it sure works for me.

The *Bob Livingston Letter* has a piece about hyperactivity ... pointing out that

Continued on page 17

Inside the ARRL — the REAL Story

Show this to your ARRL Director if you want ham radio to survive.

Ever since the first issue of 73 Magazine in October of 1960, it certainly has appeared that Wayne has a problem with the ARRL, even though in his very first editorial in 73, he published a few "Policies" about the direction in which he wanted the magazine to go.

The first of these policies was the statement "We are not mad at anybody." Well, while he may not have been angry, his frustration with the lack of direction within amateur radio was obvious, and most of his ire seemed to be directed toward the ARRL.

What's right with the League

Being one who tries to keep an open mind on most things, I chalked up his attitude to mostly "sour grapes," since he wasn't running an organization nearly as large and powerful as the League, or publishing a magazine like *QST*. So, for many years, I read his editorials with interest, but didn't really react. However, this all changed when in early 2001 I accepted a position with the ARRL as an electronics engineer, in charge of working on interference problems reported by hams.

One of the things that immediately struck me when I started there was how wrong Wayne was when he made statements about how the League's leaders should spend less time on the golf courses of Newington, and more on preserving, protecting, and advancing the hobby.

I now believe that Wayne was just using poetic license to make his point, because I found an organization being run on a shoestring, and not located in a high-class location. As far as I know, there's not even a miniature golf course in Newington, much less a real one.

I have no way of knowing if all the excesses on the part of League officials at the WARC some 40-odd years ago that Wayne says he observed actually happened, but I have seen no evidence during my stay there of such behavior. All I can say for sure is that the employees at the League are hard working and dedicated, and work for very low pay. In my case, I accepted the job only because I thought it would be fun to work in ham radio, and didn't want to move to Texas or California, where the jobs in my specialty were located at the time. The salary I accepted was about one-third of what was being offered in the real world, but it seemed to be the easy path to take at the time.

Once I got there, I was amazed at how diligently the League works for the good of amateur radio as they define it. For instance, people can send in questions about technical, legal, or

operating matters, and great efforts will be made to ensure that those inquiries are answered promptly. Back in the days when there was a lot of building going on, it never even crossed my mind that I could go to the League for help, which I have to assume was available back then as well.

Beyond that, the ARRL VEC processes most of the testing for amateur licensing — far more than all the other VECs combined — and any DXer who isn't a member is missing out on the services of the outgoing QSL bureau, where you can send in a pound of cards along with eight dollars and they take care of distributing the cards to other bureaus all over the world — saving you far more than the membership fee. Then there are the educational programs that give many people access to information that would be difficult to find on their own. I could go on and on, but I'm sure you get the idea.

Regardless of whether you like the ARRL, you **SHOULD** be a member if you have any real interest in seeing the hobby continue, simply because they are trying to do so much with very few resources. Again, like it or not, the League is the only organization we

have that may be able to keep ham radio alive and well over anything more than the next 20 years or so.

Even if you hate their guts, you can do yourself and ham radio in general a great service by joining, and — far more important — you can be a participant in letting the League leadership hear from you about what you would like to see happen in the hobby. I say this because I have observed that the people in charge really jump when a member contacts them on any matter.

What's wrong with the League

This is the part of the article I am writing because it needs to be said, not because I am going to enjoy it. When I said above that you should join and participate, I meant that the funding you provide will enable the League to provide more and better services, but in order for the process to work, it is imperative that you keep in contact with your Directors, Vice Directors, Section Managers, et al., on a regular basis and let them know what you think and what you want done.

This does not mean that you have to haunt them or bury them in mail and E-mail messages, but at the very least let them know your opinion about what you want and what the League is doing or not doing, at least twice a year. There are two Directors' meetings every year, and if anything is going to get accomplished, it will usually happen there. My impression has always been that the League sails majestically on its way, without much interest in receiving input from the "little people" who pay the bills. Even worse, they seem to enjoy promoting the idea that they are somehow above the rest of us and they will read the truth to us from the stone tablets they were given by Hiram Percy Maxim some 75 years ago.

Another thing I observed is that the Directors enjoy the prestige of being Directors, but they are all busy people who have their own lives to lead, and consequently they cannot spend a lot of time on League matters. It appears that the agenda of the Board is pretty much set by the so-called "Executive Committee," which predominantly consists of League employees. This is not

necessarily a bad thing, but it sure does seem to suppress alternative points of view. My feeling is that the Executive Committee decides beforehand what will be done, and the Directors eventually go along, after some discussion on minor points — but nothing that will change the essence of the pre-made decision.

It is for this reason that the members must stay on top of the Directors to ensure that the things they want done are attended to. The impression among the Amateur community in general is that their opinions don't count. I can assure you that any communication from a member is taken seriously, so it's up to you to decide if you have the desire and interest to work to advance ham radio by taking the time to let your elected officials know how you feel about things.

While we pride ourselves on being members of a cutting-edge hobby, the leadership of the League is anything but cutting-edge. While I was certainly not privy to what went on in Newington during the Incentive Licensing fiasco, my guess is that there was no evil plot on the part of the League, but rather a lack of comprehension and foresight on the part of a few ARRL leaders who were probably too lazy, incompetent, and self-serving to really think it through.

There was a *QST* editorial written back in the early 1960s that simply said, "There is something wrong with Amateur Radio," but it never said exactly what the problem was and never suggested a solution. Probably out of this came a proposal from the ARRL to the FCC recommending that the Commission begin to tighten up on licensing requirements, without any clear reason given as to why this was necessary or what the benefits might be. The result was the "Incentive Licensing" disaster. Even then, at a relatively young age, I had the feeling that it should have been called "DIS-Incentive Licensing."

This poor judgment on the part of the League was devastating to all of amateur radio in America. When all this was happening, many of you were not yet into the hobby, but it is important for us all to really grasp how profoundly

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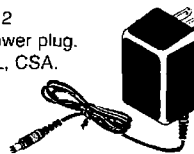
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this shoddy decision-making on the part of the leadership has affected the entire hobby, right up until now. Not surprisingly, given the past track record and attitudes, there are still leaders at ARRL who will not admit it was a disaster that had permanent negative consequences for the hobby. They are oblivious!

The primary philosophy at the League seems to come down to this: Circle the wagons, do whatever you can to prevent new ideas and concepts from being considered, and, above all, protect your own turf.

A few months ago, I had a chance conversation with a number of people who just happened to meet in the halls at Newington, and the subject of Incentive Licensing came up.

I said that I thought that it had been unfair to the hams of the time, and if it had been really necessary at all, it would have been better to just make it a little more difficult for newcomers — taking away existing privileges seemed to me to be reason enough for anyone to be upset.

Dave Sumner, the CEO, spoke up and said something to the effect that “you’re just unhappy because you lost some frequencies,” which was completely untrue in my case since I had passed my Extra Class license test at the FCC Field Office several years before the Incentive Licensing tidal wave struck, and the direct cost to me was nil. As a matter of fact, I was really into DXing on 40-meter CW, and from a selfish point of view, I could say that it was great!

I still recall having a ball on that first night in November 1967, when the new rules took effect, and the vast majority of operators were no longer allowed to use frequencies that had been perfectly legal for them 24 hours earlier. I experienced much less QRM than usual, but I also realized that it just wasn’t right.

To this day, I have been unable to understand what the point of that move had been, or just who thought they would benefit. It certainly didn’t give anyone any incentive that I could see. All it did was generate a lot of ill will among those who didn’t have the ability to

obtain their Extra Class license. Once the magnitude of the disaster became obvious, the League just pointed to the FCC as the culprit, without ever acknowledging their part in initiating the whole mess.

Did you ever wonder why ALL the American ham radio manufacturers and dealers simply faded away within a year or two? The enraged or discouraged hams sold their equipment at tremendous discounts, prices plummeted, and nobody was buying new products. No sales, no companies — it was as simple as that.

It’s pretty obvious that the ARRL leadership really didn’t “get it,” and I feel that a similar attitude still holds there today.

For instance, we have all heard the grumbling from both sides of the issue about the Morse code requirements for a ticket. I know for a fact that many among us are absolutely sure that the ARRL is trying to eliminate all code requirements for amateur licenses, but there is also another large group of hams who are just as sure that the ARRL is trying to force Morse code on anyone wanting to get a ticket, no matter what it may cost the hobby.

Obviously, both sides cannot be correct. I have come to the conclusion that the League is being pulled both ways by a few vocal individuals, and that it will not address the issue for fear of political repercussions.

From what I saw from the inside, there is great concern over how to best proceed. Personally, I use CW for well over 95 percent of my contacts, just because I enjoy it. However, the plain fact is that other than enjoying the sound and the skills that go along with CW, there is very little practical reason to make it a requirement for anything at all — since most of the world no longer uses it.

What is missing here is a vision of how to recreate the kind of mystique and attraction of ham radio that existed from the very beginning of radio. The first time I heard a shortwave receiver, I was hooked! Today, nobody is looking into how to make the experience just as vibrant for succeeding generations. If we don’t get new blood into the hobby,

and very soon, it is my opinion that it will all fade away in the next couple of decades. Yet no one at the ARRL seems to be grasping that fact.

While they have a program to promote the hobby in selected schools, nobody (outside of Wayne, and who listens to him?) is promoting the idea that each one of us should be doing all he can to introduce newcomers, especially youngsters, into the hobby. It is certainly a technical hobby, but most people at the top don’t seem to understand that it is primarily an intensely personal and emotional experience for most who become deeply involved.

The fascination is not primarily the love of electronic components and equipment — it is in the way it grips a person’s heart. However, what specific issue needs to be addressed is not important — rather, the problem is with the narrow-minded people at ARRL who need to open themselves up to some new ideas. Despite all the great things that have been done by Amateurs in the past, the hobby is undeniably stagnant. Unless there is some new dynamic leadership at the League, the hobby is doomed.

To show clearly the ossified attitudes permeating the ARRL, I will bring up my own case, where I ran into the closed minds that “knew” that telecommuting could not work, despite the fact that many large and successful companies like IBM and Microsoft have been doing it for years.

It did not seem to matter to the League that I had a broadband Internet connection, several telephone lines, a fax, a copier, a laser printer, remote access to my E-mail and voice messages at my desk in Newington, etc. — in short, everything that would allow me to work from home more efficiently than from Newington. (As an aside, *73 Magazine* is published almost totally through the use of telecommuting.)

When I accepted the job at the ARRL, I did indeed understand that it required my presence in Newington, but when I later developed some serious vision problems and the commute was becoming both dangerous and stressful, I hoped that Mark Wilson, the League’s chief operating officer,

and Ed Hare, the supervisor of the laboratory, would recognize the outstanding results I had been producing, especially in handling the ever-expanding list of power-line noise complaints. I even asked that they give it a trial before making their decision one way or the other.

Their response to my proposal was a letter stating my termination date. To make matters worse, while the person they replaced me with is reputed to have great technical skills. I have been told by a number of people who have known him in his earlier tour of duty at ARRL that he is almost completely lacking people skills. It makes me uncomfortable to even mention this because I don't even know him, and he is probably a very nice person like most of the other League employees, but I am even more concerned with the future of amateur radio and with how the effort to control interference will dwindle without the proper focus and direction.

While I am a graduate electrical engineer, it is not necessary to be Albert Einstein to understand the technical part of the problem. However, it IS critically important to have outstanding communication skills and empathy for all the people you must be in contact with, including the affected amateur, the power company, and the FCC, among others.

This situation has the potential to become another disaster for amateur radio because we were making great progress in this area for the very first time, but now I fear that it will fall back to the old approach wherein the League just gives everyone lip service, but doesn't accomplish much. If the power-line problems weren't so common, it might not be all that important to anyone other than the affected ham, but as things get worse and worse, we will all have less inclination to subject ourselves to this aggravating phenomenon and just find another hobby.

More important, the whole problem revolves around the way the League handles any matter that might be even slightly controversial. I mentioned to my boss many times that it was my

opinion that the corporate culture at ARRL could best be described as "wimp-ism," but he strongly disagreed.

However, I have observed in many cases that they will go to any lengths to avoid facing simple truth. This might be in telling someone that they are wrong, or even worse, in admitting that there really isn't much more we can do in a lot of these cases. This would never be allowed, because it might make someone appear to be less than omnipotent.

There are currently a large number of open power-line interference complaints that have been in the hands of ARRL, some for more than two years, and the League and the FCC have repeatedly been in contact with the offending companies with no significant results. When I tried to push this issue either in-house or with the FCC, I was given the clear message to just let things alone, don't rock the boat, and so forth. There have been many cases that have been ignored by the power companies, but no one seems willing to stand up for the affected amateurs, something that is clearly not in the best interest of amateur radio.

In a meeting held in Newington in July of last year, some of these really bad cases were discussed with Riley Hollingsworth of the FCC, but I was told by ARRL management to let the matter slide. The only result of all these discussions was that the FCC agreed to send yet another letter to the worst offenders, saying in effect, "We really meant all that stuff we said before, and you had better do something this time."

If you believe that approach is going to accomplish anything, you probably also believe in the Easter Bunny and the Tooth Fairy. I have heard from a number of hams who have been told by their power company that they didn't care what the FCC had to say, they were going to continue to do as they pleased, and they were sure that the FCC would do nothing. As discouraging as this may be for amateur radio, I am coming to the conclusion that they might be correct. It is very easy to send official-sounding letters, but much more difficult to actually do

anything useful. It is pretty obvious that the League cares far more about maintaining their cozy relationship with the FCC than they care about working for the welfare of the members.

For all these reasons and many more, the only hope for improvement of the situation is if the League membership decides to take a short pause from rag-chewing or contesting and take a careful look at just what is going on inside their national organization. If you really care about our hobby, I beg you to become involved. I promise that you will have a much greater effect than you probably think.

K2QAI is a former ARRL RFI Engineer. — ed.

73

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World Radiosport Team Championships — 2002

A photoreport.

This is an event which could be compared with the Olympic Games. The tradition of the Olympics is thousands of years old — the Radio Olympic Games were initiated in 1990 in Seattle, WA.

The principles are simple: Teams consisting of two operators from the same area, and having approximately the same antennas, participate in the IARU HF Championship the second weekend of July. In July of 2002, this event took place in Finland, and all the antennas were exactly the same, made locally. Previously, in 1996, the WRTC had been hosted by San Francisco, CA hams; in 2000, by the Slovenia Contest Club.

In case you don't know where Slovenia lies — it's a country smaller than New Jersey that for decades had been a part of Yugoslavia, and is tucked between Italy, Austria, Hungary, and Croatia, with narrow access to the Adriatic Sea.

Finland is probably better known. Placed in northern Europe, between Sweden and Russia, the country has undergone a transformation from a timber- and farming-dominated economy to a modern, diversified industrial community during the last 20 to 30 years. One of the side effects of their advanced cell phone industry (Nokia is Finnish!) is a large number of cell phone base stations with high antenna towers. A few more antenna towers with amateur

radio antennas do no harm, according to local lawmakers, I presume. An average contesteer in Finland has a 100-ft. rotary tower with stacked arrays. On the other hand, most of them are hidden in forests, and finding them was not easy for me.

The "games" took place in the southern part of the country near the capital city Helsinki. There were 52 teams from several countries. Going there and meeting the competitors, referees, judges, and other visitors was actually equivalent to making an around-the-world trip. Anyone interested in details of the competition and the results can find these in printed magazines as well as on the Web. The official site is at [www.wrtc2002.org].

Most of my pictures were taken at the annual Finnish ham radio camp in a small place called Himos. The WRTC crowd, including foreign visitors like me, was hosted there for a few days and could socialize as well as adapt to the Midnight Sun. How many bottles of beer were emptied there? Don't know — it is not mentioned in the final scores.

Except for the hosting Finns, the Americans were most numerous at

WRTC 2002. It has a natural explanation — there are many, both ambitious and proficient, amateur radio operators in the USA. Sometimes I have a feeling that as many U.S. contest logs are submitted in major competitions as from the rest of the world.

The Olympics of amateur radio take place during the IARU HF Championship. This contest has only advantages. It is short, lasting for only 24 hours. The 48-hour events have the disadvantage of starting on a Friday for everyone west of Greenwich and ending on a Monday for everybody else. It covers both modes — phone and telegraphy. Points are related to ITU zones and also given for contacts within a country. Contest results are announced and certificates are mailed promptly. Even the most zealous contest foes have really little to complain about. During the WRTC 2002 in Finland, the teams were given short callsigns (with OJ1 to OJ8 prefixes) only 5 minutes before the contest commenced. Each team was closely watched by a referee, and hosted by a local ham.

The organization was terrific. I don't think any other group in the world will be able to come up to snuff with the



Photo A. Country banners on the ground outside the tent, just before the official opening ceremony.



Photo B. The official WRTC 2002 beer.



Photo C. Part of the Canadian representation: (left) John VE3EJ, Jim VE7ZO.



Photo D. Some folks from the Estonian group really camped on the summer camp cf. Himos.



Photo E. Canadians on the left, VE3EJ and VE7SV; Ivo 5B4ADA, living in Cyprus now, and OH6XY, far right.

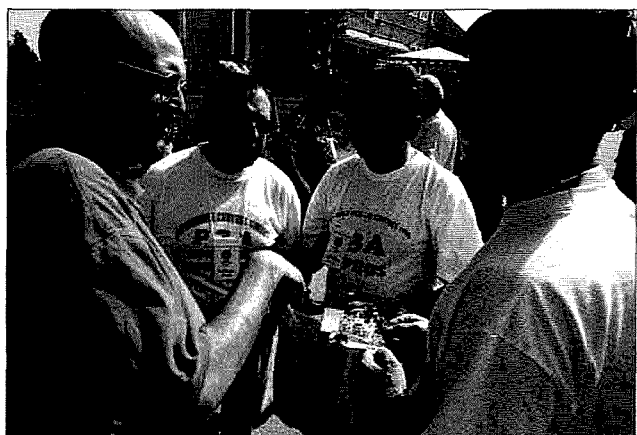


Photo F. Stewart KC1F, a referee of the games, talking to UA9s from Asiatic Russia.



Photo G. The Russian group, Igor RA3AUU up front.

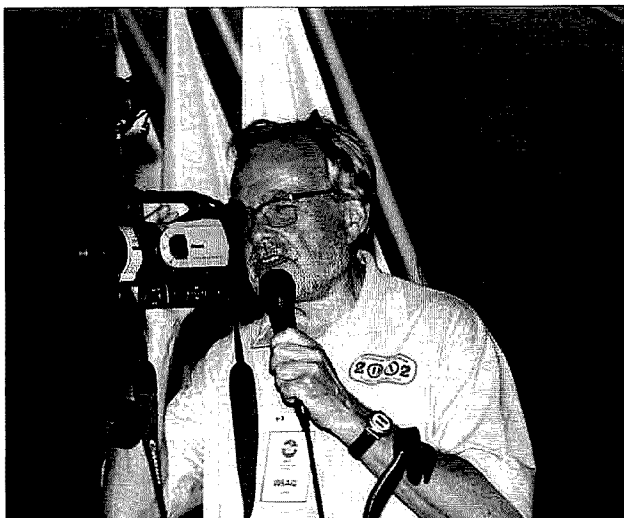


Photo H. Dave W6AQ of Hollywood, CA, shot the event on video.



Photo I. From left to right: John K1AR, Bob K3EST, Doug K1DG, Trey N5KO.



Photo J. Left to right: Claudio LU7DW, Lucas LU1FAM, Dave G4BUO, Emily P43E (from Aruba).



Photo K. Swedish referees, right to left: Janne SM3CER, Thomas SM3DMP, Tord SM3EVR.



Photo L. From left: Rich K1CC, Thomas OZ1AA, Jim N3BB, Trey N5KO.

Contest Club Finland, which, in cooperation with the national radio league (SRAL), staged a rich and flawless program. Kudos to the Finns!

When the on-the-air activity was over at 3 p.m. local (summer) time on Sunday July 14, 2002, everybody went to Helsinki to submit the computer log files and have some rest. Several hundred logs from all over the world were E-mailed to Finland, and the intensive checking process began. Next day, Monday, the official results were announced and the team of Jeff N5TJ and Dan K1TO made it to the very top again. But the Russian and German teams were very, very close. Basically, all the



Photo M. South Africans: Chris ZS6EZ and Bernie ZS4TX.



Photo N. Ward NØAX, who, apart from writing about the event, also collaborated in the Unofficial WRTC2002 Song Book and served as referee.



Photo O. Modest winners of WRTC2002: Jeff N5TJ (right) and Dan KITO (Center). The gentleman on the left is Ken KIEA, who influenced contesting by creating a logging computer program called CT.

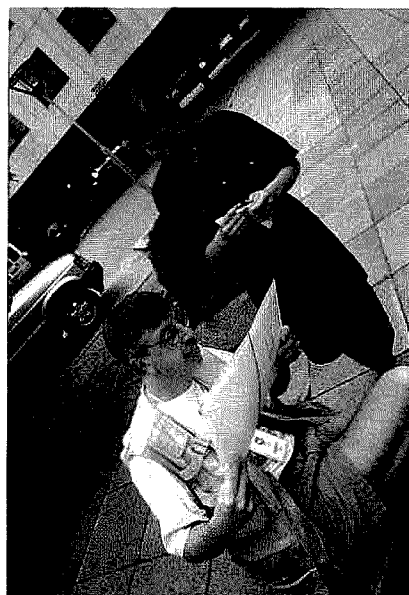


Photo P. A side effect of staying almost a week in Finland — Peter ØN6TT tries to order lunch in Finnish.

participants of WRTC are excellent operators and really represent the state-of-the-art level of human interface with HF radios. An event like

this needs more support from all member societies of the IARU, and, of course, all amateur radio operators of the world. It strengthens the

global position of our hobby — united, we are strong. The WRTC 2002 event was officially addressed by the president of Finland. **73**

NEVER SAY DIE

continued from page 9

hyperactive children almost always have abnormal blood sugar. So we give them Ritalin. Check [www.ritalindeath.com] for info. These drugs have known side effects of heart damage, seizures, behavioral changes (mania), loss of consciousness and death.

The sugar from one soft drink (now being sold in almost every school ... which get a commission)

results in inattention, depression, sleep disturbance and cravings. Sugar is addictive.

Van Allen

He's the guy they named the radiation belt that surrounds Earth after. Never mind that Nicola Tesla predicted it about 70 years earlier.

Anyway, *Time* had an article about Van Allen, now 88, and is still hard at work. He says that the charged particles

emitted by the Sun reach out more than 7.5 billion miles. That explains why the radiation field is so strong only 93 million miles away, where the Earth and Moon are. It also explains why any astronauts venturing beyond Earth's protective Van Allen Belt are going to need a lot of heavy duty shielding from this intense radiation if they're going to live more than a few minutes.

No, those Apollo missions did not have heavy duty shielding.

Continued on page 59

Getting Back a Gertsch

Adventures in refurbishing a Singer-Gertsch FM-9 frequency/deviation meter.

For most hams, the name Gertsch requires no introduction. Gertsch test equipment had quite an impact on two-way radio equipment starting in the early '60s. During this period, commercial two-way radio gear was being recycled from commercial applications into ham radio usage.

Most of the early gear was used for the VHF band, with some also opening up the way for the generation of ham repeater systems in the UHF band.

As a result of the influx of commercial gear into the realm of ham radio, modulated oscillator-type transmitters and superregen receivers gave way to commercially built crystal-controlled equipment. Because it was crystal-controlled, hams then desired to “net” their equipment so they could operate on channelized frequencies.

Many techniques were developed by hams to align their equipment to a given frequency channel. In commercial usage at that time was the Gertsch line of frequency meters and Motorola test sets. Both pieces of equipment were very accurate frequency transfer standards that allowed the setting of both frequency of operation as well as the deviation of the FM signal.

It was during this period of time that those hams working in the commercial radio field teased those who didn't have access to commercial equipment

with their use of a “Gertsch” for setting up their radio equipment. Most hams had only heard of a Gertsch and actually knew very little about them — and that included me.

The Gertsch frequency meters remained out of the reach of most hams for a long time, until later on

when some of the older models reached the swap meet tables. During this period of time, Singer took over the Gertsch line of equipment and made a number of technical improvements — but that's straying a bit from the point that I'm making, which is that test equipment is a “ham's best friend.”

I have a Gertsch FM-9 signal generator/test set that was given to me as a gift. It was not functioning and was in need of repair. **Photo A** shows a front panel view of the FM-9 and **Table 1** shows the specifications for it. The capability of the equipment is excellent for most ham applications and really “fit the bill” for the time period that it was built. Except for its massive size, the capability of the Gertsch FM-9 makes it a valuable piece of equipment for most any ham experimenter's test bench.

Inside the FM-9

The story that I'd like to lead you through involves getting the FM-9 to operate after being out of service for apparently a very long period of time. Servicing the Gertsch isn't for the weak of heart, since the circuitry is

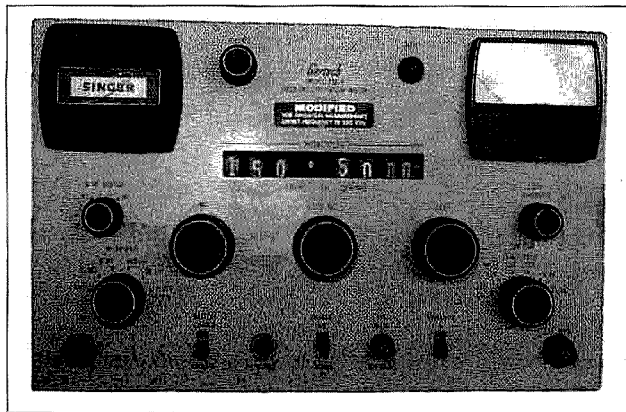


Photo A. A front panel view of the Singer-Gertsch FM-9 frequency/deviation meter.

reasonably complex and the alignment of the internal circuits is quite critical. True. I didn't know anything about it either, but was willing to study and learn from the device. You must be familiar with phase-locked-loops and how to deal with them when they tend to drop out of lock. **Fig. 1** shows a simplified block diagram of the FM-9 showing the three VCOs and the LFO that are used to make up the signal generation/selection portion of the device. In addition to the generation of a signal, the FM-9 has a built-in low sensitivity receiver. The receiver portion utilizes the FM-9's generated output signal as a local oscillator that mixes with an incoming signal to create an intermediate frequency (IF). As I determined from working with my

FM-9, the original factory setting for the IF was 450 kHz and later on the factory shifted the IF to 300 kHz. A sticker was placed on the face of the test set to indicate the modification. The receiver's IF path consists of an amplifier-limiter driving a frequency discriminator. A meter is mounted on the front panel providing a visual indication of tuning, signal strength, and two levels of deviation. In addition, an audio amplifier is included for monitoring the FM sounds being received.

The heart of the FM-9 is a 1 MHz crystal that's mounted in a temperature-controlled oven. When at temperature, the crystal's frequency stability is fantastic to say the least. In addition, the frequency of the crystal in my FM-9 was so close to WWV that

I had some difficulty determining how close. Yes, a counter indicated it was on frequency, but I was interested in knowing how the crystal's frequency compared to WWV. Because the frequency was so close to WWV, I refrained from touching the frequency adjuster because I could have only made a good thing worse.

To provide a frequency reference for the FM-9, the crystal's frequency is both multiplied as well as divided as shown in **Fig. 1**. A multiplier is used to increase the crystal's frequency to 130 MHz, allowing it to become the VHF frequency reference for the high frequency VCO. The divided output from the crystal is used for setting up the reference frequencies for the low

FREQUENCY		EXTERNAL FREQUENCY MODULATION	
RANGE		150 - 162 mc	
Fundamental	150 - 162 mc	300 to 3,000 cps	5 kc deviation
Harmonics	450 - 486 mc	100 cps	2 kc minimum
ACCURACY	± 0.0002% (± 2 ppm) (After 30 minutes warmup)	450 - 486 mc	
		300 to 3,000 cps	15 kc deviation
		100 cps	6 kc minimum
DEVIATION MEASUREMENTS		Required Audio Input . . 1 vrms (approximate)	
RANGE		AUXILIARY OUTPUTS	
Low	0 to 5 kc	IF ALIGNMENT SIGNAL	
High	0 to 15 kc	Frequency	400 - 500 kc, with high harmonic content
ACCURACY	± 5% of full scale	Amplitude	3 v peak to peak
		Source Impedance	1 k
SENSITIVITY, FREQUENCY, AND DEVIATION MEASUREMENTS		CRYSTAL CALIBRATION	
150 to 162 mc	1 mv	SIGNAL	1 mc pulse
450 - 486 mc	5 mv	POWER REQUIREMENTS	
RF OUTPUT		AC	115/230V, 50 to 400 cps, 7 va
RANGE		DC	11.5 to 15 v, approximate 0.3 amp average current, NEGATIVE ground
150 - 162 mc	50 mv to 0.5 uv	OPERATING TEMPERATURE	
ACCURACY (Calibrated into 50 ohm load)		RANGE	32° to 120°F (0° to 50°C)
0.5 uv	± 2 db (With RFA-20)	FURNISHED ACCESSORY EQUIPMENT	
All other points	± 4 db	Built-in battery charger and voltmeter	
ZERO BEAT INDICATORS		Six foot coax cable .50 ohms	
Aural	Built-in audio amplifier and speaker	BNC to UHF connectors	
Visual	Meter	DC power cable, cigarette lighter connector	
		RFA-20 attenuator	

Table 1. Singer-Gertsch FM-9 specifications.

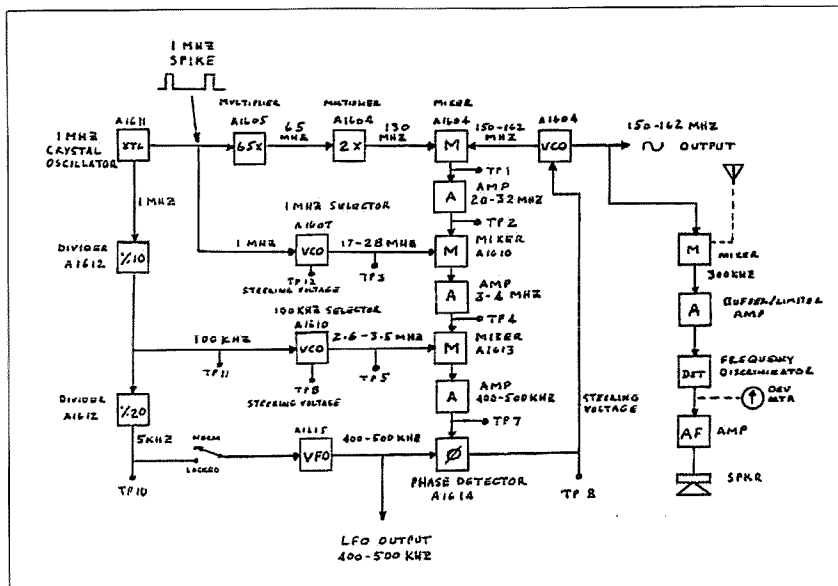


Fig. 1. This is a functional block diagram of the FM-9. Module designation numbers, test points, and frequencies are shown.

frequency VCOs and for "locking" the LFO (unlocked is the normal position).

While on the subject of the LFO, it is locked only for special situations where it can be "locked" at 5 kHz increments. Because the LFO does not have a closed loop, it doesn't phase lock as such, but you can hear the beat note in the speaker when the LFO and 5 kHz signal begin to match (zero beat).

To create a multiple number of discrete frequencies, the FM-9 utilizes the output from each of the three VCOs by creating frequency mixes. The mixer chain creates a signal channel that's equivalent to the intermediate frequency path of a superheterodyne receiver. As each frequency is mixed along the path, the combined/resultant frequency is mixed with the LFO and routed to a phase detector whose output is the tuning voltage for

the HF VCO. The above explanation is a simple summary of what actually takes place within the system.

Troubleshooting

I'd like to lead you through the steps that I followed to both examine and troubleshoot my FM-9. First off, it's my philosophy that if the equipment operated once, it should be repairable in order to operate again. By that I mean that it's necessary to find the fault and repair the circuit, not redesign the circuit. Unfortunately, during my examination of my FM-9 I found two areas that failed to work "as designed" and I had to make minor changes to compensate for the problems.

During an overall examination of the FM-9, I found all of the components to be functional and operating pretty much as designed — no "bad" parts were found. The majority of transistors were germanium, and substituting them with silicon devices only degraded the performance; that meant that I had to stay with the transistors mounted on the boards. It appeared to me that the circuits were all operating on a narrow margin and that any slight shift in a circuit parameter stopped the circuit from performing as needed to keep the system functioning. Being an all-discrete device design,

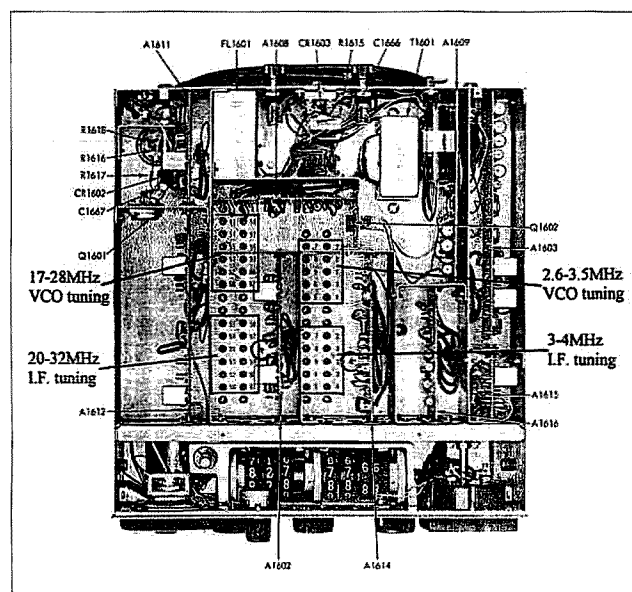


Photo B. Topside view on the chassis showing all of the alignment adjustments for the two low frequency VCOs.

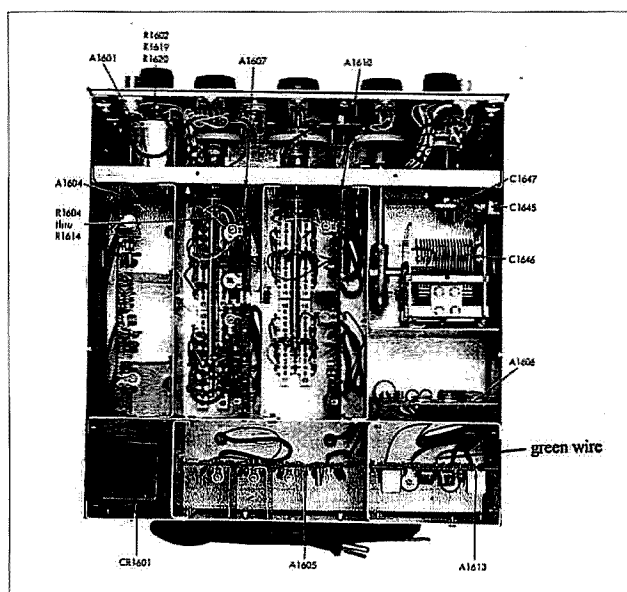


Photo C. Bottom side of the FM-9 chassis. Module numbers and the "green wire" are shown.

every component can be examined individually for problem-solving, if necessary.

The process that I used for examining the FM-9 was to study each module to both gain an understanding of it as well as determine how well it was functioning. After making the rounds through the modules several times, I ended up each time at the 20-32 MHz mixer as being the failing module. My question each time was, "Why isn't the mixer outputting a signal?"

The signals entering from both the multiplier and the VCO appeared to be sufficiently high, although I still question the signal output amplitude from the 130 MHz multiplier. Using an oscilloscope I measured a signal level of 70 mVpp applied to the mixer when I would have liked to have seen a signal amplitude closer to 200-300 mVpp. But the signal level wasn't to be any higher! That forced me to re-examine the mixer to see if it was capable of mixing at the input levels received from the 130 MHz multiplier and the HF VCO. I built up an external mixer identical to the internal one and applied variable-level signals into it. From that experiment I quickly determined that the mixer required a higher signal injection level than it was getting from the 130 MHz multiplier. Everything in the multiplier appeared to be working well and I wasn't able to increase the signal output level with alignment nor with a component change. That left me with the mixer as the design change option. After studying the FM-9 schematic I concluded that the emitter resistor in the mixer circuit could be increased in value to raise the injection level sensitivity — and that worked well. I changed the emitter resistor from 150 ohms to 1k. The output signal from the mixer was now strong enough to provide a signal into the 3-4 MHz amplifier and mixer circuits.

With the mixer resistor change, the overall system began to lock on some frequencies which indicated that I was on the correct path, but as yet, had not reached the final goal. The next step was to do a complete alignment of the test set. I really made a mess of the thing after reading through

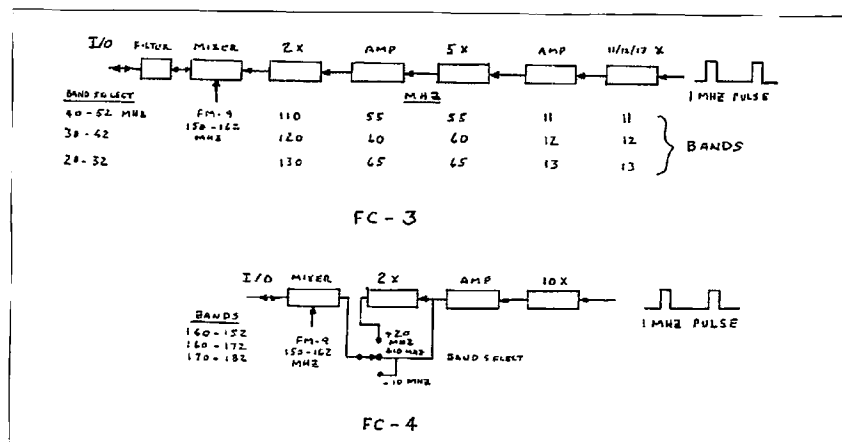


Fig. 2. Singer-Gertsch frequency converters used to extend the frequency coverage of the FM-9 frequency/deviation meter. The FC-3 covers the frequency range of 20-52 MHz. In addition, the FC-3 may be used to convert signals in the 260-292 MHz band. The FC-4 covers the frequency range of 140-182 MHz.

the alignment procedure provided in the book and attempting to follow it — not sure why!

As a result, I developed an alternate alignment procedure that worked for me as shown in the sidebar. The basic steps involve getting the 17-28 MHz and 2.6-3.5 MHz VCOs onto the correct frequencies with each FM-9 dial setting. Once those VCOs lock correctly, then the rest of the system begins to work as designed. **Photo B** shows the adjustment locations for the VCOs and their respective amplifiers. There should be *no need* to adjust the amplifiers unless components are changed.

I used two techniques to verify the correct frequency for each of the two VCOs. The first step was to temporarily block the sweep signal and to "look" at the output signal using a receiver tuned to the VCO frequency. With the sweep blocked, the VCO frequency was adjusted at each dial setting. As each adjustment was made, the block was lifted to see if the VCO remained on frequency or jumped away.

Once both VCOs appeared to be locking correctly, the FM-9 operated over most of its operating range. An unlock failure occurred when slewing the LFO from "zero" frequency to 100 kHz. To sort out this problem, I connected my oscilloscope to the detected/rectified IF output signal (green

wire) on module A1613 (see **Photo C**) and watched the voltage value while slewing the LFO dial. It appeared the voltage level was dropping off as the LFO was slewed toward the higher end of the tuning range. So the question arose as to how one might obtain a little more signal amplitude in order to retain "lock."

Since an alignment had been done a couple of times in hopes of raising the signal level, and changing transistors failed to help, the only opportunity remaining was to try a minor design change. Upon examining the 400-500 kHz buffer amplifier (module A1613) that follows the mixer, I noted that an un-bypassed emitter resistor was used in the design. An un-bypassed emitter resistor creates some signal degeneration within the stage. What would happen if a bypass capacitor was added across the resistor? Upon adding a 0.001 μ F capacitor, the signal level into the phase detector rose significantly — but system phase locking ceased. Apparently, the addition of the bypass capacitor raised the signal level too much, causing the frequency sweep circuit to be inhibited (without a sweep, the VCOs fail to tune to a "lock" frequency). When phase lock occurs, the sweep circuit normally stops except for a "tickle" indicating that it's ready to sweep when a dial setting is changed. Anyway, to "fix" the gain issue, I tried

Singer-Gertsch FM-9 Alignment Procedure

Note: This procedure works only when the test set unlocks periodically or on some dial settings — in other words, if alignment of the two low frequency VCOs is the only fault.

Test equipment

1. A receiver that is tuned digitally in the 2.6–3.5 MHz and 17–28 MHz bands. Connect a probe, equivalent to a scope probe, to the antenna input connector. The probe tip must be insulated to prevent electrical contact.

2. A frequency counter that responds to a signal in the 150–162 MHz band.

Test steps

1. Remove the top cover from the FM-9 to expose the alignment adjustments as shown in **Photo B**.

2. Turn on the FM-9 and allow it to warm up for at least 30 minutes.

3. Rotate the dial settings at random until a “lock” is achieved.

(a) Compare the counter’s frequency indication to the dial setting.

(b) If the two compare, the two low frequency VCOs are set correctly for the indicated dial setting.

(c) If the two indications do *not* compare, then one of the two low

frequency VCOs is locking on an adjacent frequency.

4. Finding and adjusting the two low frequency VCOs (2.6–3.5 MHz and 17–28 MHz). Note: The receiver’s test probe will have to be placed in close proximity to the appropriate adjustment screw for a signal to be detected.

5. Adjustment procedure notes: (a) Using both the receiver and the counter, verify that frequency indications compare to the FM-9 dial setting after each adjustment. (b) To achieve an equal +/- lock on the “MC” range, the “100KC” dial is set to XXX.5000 when adjusting the 17–28 MHz VCO through all settings. (c) Refer to **Photo B** for the appropriate adjustment screws. The screw number matches the dial setting number. When turning an adjustment screw, less than 1/4 turn is required to pass through the adjustable lock range. (d) Adjust only the VCO frequency adjustments. Do not adjust the IF amplifier tuning screws.

6. Adjustment.

A. Select each dial setting to ensure that a “lock” occurs. With each dial setting, compare the counter’s indication to the dial setting. Should the dial and counter not agree, do the following:

(1) Take note of the “MC” and “100KC” dial settings.

(2) Using the tables from Step #4 above, determine the expected frequencies for the two low frequency VCOs. As an example, when a loss of lock occurs at 155.5XXX, the 17–28 MHz VCO should be operating at 22 MHz and the 3–4 MHz VCO should be operating at 3.1 MHz.

(3) Probe adjustment screw “55” for a frequency of 22 MHz, and probe the adjustment screw “5” for a frequency of 3.1 MHz.

(4) Adjust (1/4 turn or less) the appropriate screw to achieve lock at the correct frequency.

(5) Compare the counter’s indication to the dial setting.

(6) Continue the dial selection/comparison routine while making the appropriate adjustments until all settings show an indication of “lock” at the correct frequency.

B. Loss of lock while adjusting the “LFO” dial.

Note: Check the 2.6–3.5 MHz VCO when a loss of lock occurs while rotating the LFO dial.

(1) At each “KC” setting, rotate the “LFO” dial from end to end.

(2) When an unlock occurs, as an example, at XXX.2XXX, use the receiver to check the frequency of the 2.6–3.5 MHz VCO — it should be operating at 2.8 MHz. Slightly adjust the “2” adjustment screw to achieve lock at 2.8 MHz. Compare the dial setting and the counter’s indication.

(3) Rotate the “LFO” dial from end to end to test for “lock.” Repeat the “KC” dial setting to the next setting and repeat the “LFO” adjustment until all “KC” dial settings retain “lock.”

XXX.0000	2.6 MHz
XXX.1000	2.7 MHz
XXX.2000	2.8 MHz
XXX.3000	2.9 MHz
XXX.4000	3.0 MHz
XXX.5000	3.1 MHz
XXX.6000	3.2 MHz
XXX.7000	3.3 MHz
XXX.8000	3.4 MHz
XXX.9000	3.5 MHz

Table S1. Dial setting table for the 2.6–3.5 MHz VCO.

150.0000	17 MHz
151.0000	18 MHz
152.0000	19 MHz
153.0000	20 MHz
154.0000	21 MHz
155.0000	22 MHz
156.0000	23 MHz
157.0000	24 MHz
158.0000	25 MHz
159.0000	26 MHz
160.0000	27 MHz
161.0000	28 MHz

Table S2. Dial setting table for the 17–28 MHz VCO.

several small value capacitors and settled with a 39 pF capacitor. It raised the gain above the marginal threshold value just enough to allow the LFO

dial to be slewed from end to end without affecting the phase lock.

As an afterthought, perhaps the addition of a 10–100 pF trimmer capacitor

connected across the resistor would have been a better choice. Adjusting the trimmer to a “critical” value would likely have provided the desired stage

gain setting needed to improve the VCO lock range.

Second alignment procedure

Once the FM-9 began to operate over most of its dialing range, a few lock failures continued to occur. This resulted in a different approach to the alignment with a counter connected to the output BNC connector. Even though the device was apparently locking OK on most all dial settings, some of the HF VCO output frequencies were off by at least 20 kHz. Upon chasing that problem, I found the 17–28 and 2.6–3.5 VCOs were independently locking on an inappropriate frequency. When a nonselected frequency appeared at the output, the receiver was tuned to the frequency of the two VCOs to see where they were operating. If not per the listing as shown in **Fig. 3**, Test Step 4, the appropriate adjustment was made to correct the frequency. Every dial switch setting had to be checked to ensure that a correct lock occurred. After getting the VCOs to lock correctly, the entire RF generation system appeared to be very stable.

As a final comment before leaving alignment: I found an interesting situation regarding the power supply voltage. According to the book, the power supply output voltage was to be set to 9.0 V. After getting into the gain issue with several of the circuits, I found that varying the power supply voltage affected the gain sufficiently to be of concern. After doing a +/- margin test of the system lock versus the power supply voltage, I determined that setting the supply voltage to a value between 9.0 V and 9.5 V appeared to be best. I settled on 9.3 V and now my FM-9 appears to be stable at that supply voltage value.

Receiver portion

The receiver portion of the test set is comprised of an IF amplifier-limiter and a frequency discriminator followed by an amplifier. When I first started to examine the receiver section I was under the impression, as indicated in the service manual, that the IF was set

up to operate at 450 kHz. But a sticker on the face of the test set indicated that it had been modified to 300 kHz. Using an external signal generator I was able to determine that the IF amplifier had a pass band wide enough to cover both the 300 kHz and 450 kHz frequencies — therefore, it did not require alignment.

For whatever reason, the discriminator failed, at first, to respond to a signal from the external signal generator. After grounding two points within the discriminator's output circuit, I was able to electrically separate the two tuned circuits. Without the grounding, the two circuits were interacting, creating some confusing indications (the grounds were not required when the panel meter was used as an indicator). Once separated, the tuning of two tuned circuits responded as expected and their frequency was measured. The discriminator is made up of two independent diode detectors whose output is summed to create a differential voltage. One circuit is tuned to 270 kHz and the other is tuned to 330 kHz. The offset creates a very linear "S" curve that is centered at 300 kHz. Following the alignment check, I used a standard 5 kHz deviated signal to check the metering circuit on both the 5 kHz and 15 kHz settings. Both appeared to be within +/- 0.5 kHz.

Frequency converters

The basic tuning range of the FM-9 is 150–162 MHz. To be useful at other frequencies, the direct output can be multiplied up to frequencies including 1 GHz. But to go lower in frequency, Singer-Gertsch provided two converters, an FC-3 (20–52 MHz) and an FC-4 (140–182 MHz). Each converter has three bands, with each covering a 12 MHz frequency segment.

I opened up the converters attached to my FM-9 to determine how they were set up. I worked up a block diagram for each of the converters as shown in **Fig. 2**. Basically, each converter utilizes a balanced diode mixer with combined inputs from a frequency multiplier chain and the output from the FM-9 to create an output signal within the selected band.

Inside of the FM-9, the 1 MHz oscillator drives a blocking oscillator that creates a 1 MHz pulse waveform that is ideal for driving multiplier circuits. That pulse is injected into the converter where it drives a series of multiplier circuits. An amplifier follows each multiplier circuit, except for the last multiplier in the chain. The amplifier shapes the waveform to a sine wave by reducing the harmonic content at the selected frequency.

Of the two converters, the FC-3 is the more complex because of the multiplication factor changes that take place with each band selection. As an example, the first multiplier produces an 11, 12, or 13 MHz output depending upon the band selection. The output of the first multiplier is then multiplied again by a factor of 10 in two multiplier stages to achieve an output at 110, 120, or 130 MHz. The output signal frequency is derived by subtracting the multiplier's frequency from the FM-9's dial indication. In a like manner as the FM-9 (direct input), the converter allows for a transmitted signal to enter into the I/O connector and be transferred to the FM-9 as a received signal. The deviation measurement remains direct regardless of the converter band selection.

I did try an experiment to see if the FC-3's multiplier's output signal would add with the FM-9 to obtain a higher frequency. Even with the filter in the output circuit of the converter, I was able to obtain a usable signal in the bands of 260–272, 270–282, and 280–292 MHz. The FC-4 converter already takes advantage of the sum and difference to achieve the output band of frequencies.

Conclusion

Hams are the fortunate recipients of commercial test equipment that is being dropped from commercial service. Much of the gear, including the Singer-Gertsch FM-9 test set, provides hams with valuable tools for their personal test bench.

Although the FM-9 test set is a complex piece of equipment to repair, I hope that this discussion will assist in keeping this fabled piece of equipment operating for many years to come. 73

Yes, I Built Sixteen Log Periodic Antennas!

Part 2: Assembly.

After determining if there is sufficient area for the LP when aimed in the desired direction, it is suggested that a scale drawing be made showing the proposed mast locations for the LP as it will be when suspended from the masts. By drawing this to scale, it is quite easy to determine any needed or unknown dimensions.

Next, procure the necessary material for the LP selected. **Fig. 9** illustrates the construction or assembly of a typical DLP, and **Fig. 10** the monopole LP configuration.

Note that for the long rear element (#1) and the short forward element of a horizontal DLP, small ceramic egg-type compression insulators are used as these two end elements carry most of the load or strain of the center 2-wire open feed line and its center insulators or spacers. The latter are home-made from .64m (1/4")-thick Lucite or Plexiglas. This can usually be purchased at hardware, building supply, or radio stores.

The Lucite is cut into strips 1.59cm wide x 15.24cm long (5/8" x 6"). These are then drilled to make three types of insulators for the LPs, which are:

(1) End insulators for all elements (except the front and rear as mentioned above). Two holes are drilled in this type.

(2) Center insulators for the DLP center feeder which serves as the center insulator for all elements (except

front and rear), also supporting and spacing 10.16cm (4") the 2-wire center feeder. Four holes drilled.

(3) Center insulator for the monopole LP. Same as the DLP type except these have an extra center hole for securing to the $1/4\lambda$ vertical elements. For this type, the two outside holes are for securing the $1/4\lambda$ ground radials or counterpoise.

The hole spacings for above are illustrated in **Fig. 11**. These are all the same size to simplify production.

Lucite is used for these as it is difficult to locate a ceramic insulator of this type. The Lucite is light in weight, easy to cut and drill, low loss, and less expensive than commercial insulators. They average 10 to 20 cents each. Hundreds of these have been used on the LPs here. Only one has broken after four years of use.

The importance of transposing between elements cannot be stressed enough. This is accomplished either by criss-crossing the feeder as illustrated in **Fig. 1a** or by transposing the feed to the elements as illustrated in **Fig. 1b**. Both work equally well in providing phase reversal to alternate elements. The latter method is better suited for wire beams from a construction

standpoint as shown in **Figs. 6** and **10**. This method has been used here for all but one LP. It is the method generally used for the large commercial LPs.

An LP is in effect a multi-element endfire array and *must have a phase reversal between adjacent elements* as with any endfire array (example, the "ZL Special" or the "W8JK"). If there is no phase reversal between elements, you do not have an LP.

Briefly, an LP is similar to a yagi except that all elements are driven. The "active" section of an LP consists of a rear-driven reflector, a driven or "active" $1/2\lambda$ radiator, and a number of driven forward directors. It must, therefore, function as an endfire array. If the adjacent elements are not approximately 180° out of phase, there will be no forward lobe or gain.

Several OMs have written that their LPs were nondirectional and gave no gain. After checking, it was found they failed to transpose.

Antenna wire

Because the forward and rear elements and the 2-wire center feedline are the only portions requiring a strain-type wire, these should be #7/22, #7/24, or #14 copper or copperclad.

All of the other elements can be #16 soft-drawn bare copper, enameled or tinned (hookup) wire. This can be purchased economically in 304.88m (1000') spools. Even #18 has been used here, which seems entirely satisfactory — at least to 500W. This saves weight and cost.*

Since an LP has a lower Q than a yagi, there is not the high RF current in the elements. The yagi generally requires tubing, whereas wire is entirely satisfactory for an LP. Wire is used for the large commercial or military fixed LP antennas (references 1, 2, and 3). Further, since there are several "active" elements per band, the RF current is no doubt distributed over several elements. Therefore, wire is entirely satisfactory.

Soft-drawn wire is suggested for all elements except #1 and the short forward element, since there is practically no pull on the remaining elements. Being soft-drawn, the wire will not tend to coil up or kink as does hard-drawn or some of the copperclad. There is enough tension on the forward and rear elements to prevent this problem.

After all material has been collected, and the Lucite insulators fabricated, proceed as follows:

(1) First, assemble the two-wire center feeder.

Select two sturdy posts, trees, or other supports with about 1.53m (5') greater separation than the required length of the center feeder for the LP selected. Secure one end of the pair to or around the post at a height of approximately 1.83m (6') above ground level. Now thread the center Lucite insulators on the 20-wire feeder at the free end. This end may now be secured to the second post or tree. Stretch the two wires so they will be parallel and separated about 20.32cm (8") at the support ends. They will tighten to

*A number of the LPs here have been constructed entirely of aluminum wire (#15 electric fence wire, Sears Cat. No. 13K22065). This is quite inexpensive compared with copper; you can get a 402.44cm (1320') roll for \$8.70. The aluminum is also used here to reduce weight, since trees are used as the "masts."

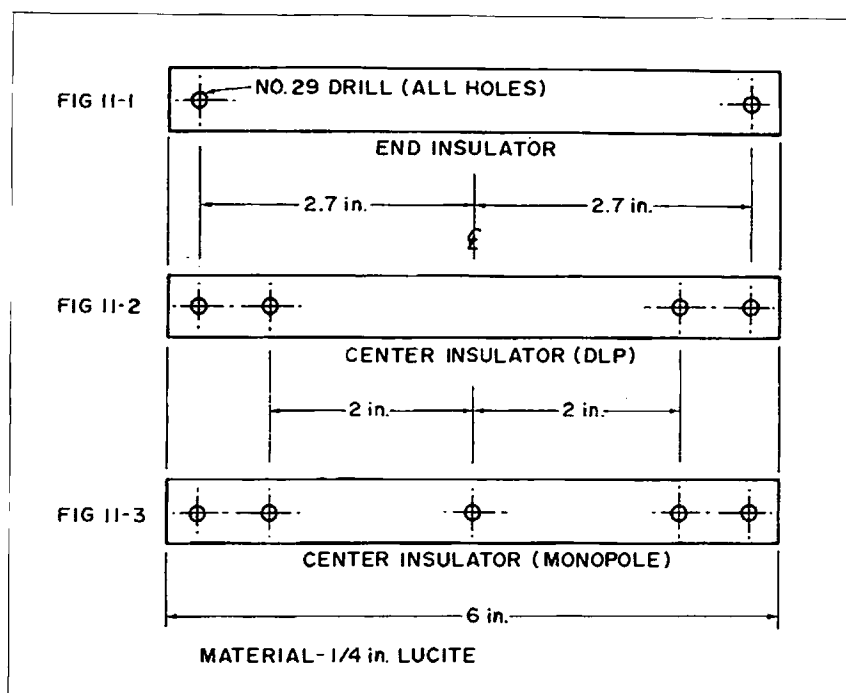


Fig. 11. Hole spacings for the insulators.

10.16cm (4") separation after the center insulators/separators are spaced. They should be about shoulder height to make for easy assembly. If necessary, two turnbuckles can be used temporarily at one end to tighten the two parallel wires and to adjust them for equal tension.

Now slide the center insulators (spacers) and distribute along the feeder in their approximate locations as given in Table 2. Starting at one end, mark or indicate the location where the 2-wire open feeder will be attached to the center of the long rear element #1. A piece of 2cm (3/4") masking tape can be used on each of the two wires to indicate this starting point, which should be about 30.48cm (12") from one of the end supports. The #1 element will be located at this starting point.

Now measure from this point with a steel tape the first spacing distance, S1, which will separate elements #1 and #2. The first Lucite center insulator will be located at this point (location of the second element, #E2). This insulator is held in place between the 2-wire feeder by means of a few turns of 2cm (3/4") masking tape served on either side of the Lucite insulator on both wires. Allow a slight distance of

"play" on each side of the insulator so the tape will not be snug against the insulator. The wires should be able to turn free in the insulator holes. This helps keep the 2-wire line from twisting after the antenna is completed. The masking tape hardens after a few days in the weather and prevents the center insulators from sliding on the wires, which would alter the correct spacing of the elements.

Next, measure the spacing distance, S2, and secure the next center insulator. Continue measuring and securing the insulators until all are in position, then measure the last spacing distance and mark with tape as was done for the starting, #1, element. This last marking will be the location of the shortest end element (egg insulator) and will also be the feedpoint to the LP.

The distance from the back side marking to the last forward marking will be the overall length (boom length) of the LP and will total the spacing distances, S1 + S2 + S3 ... etc. It is suggested that this total length of the center feeder be measured to make certain no errors have been made in any of the spacing distances. This total length is given in Table 2.

(2) The next step will be cutting the various elements (or doublets) to

length: L1, L2, etc. It is suggested that the rear element #1 and the short forward element be cut last, as these will not be connected to the feeder until all of the other elements are cut and secured to the center insulators; thus leaving the feeder attached to the supports for convenience until all except the forward and aft elements are in place, connected, and soldered to the feeder.

In addition to the actual element lengths, allow several centimeters for connecting to the end insulators and about 25.4cm (10") extra for the center connections from the element center ends to the 2-wire feeder, as *every other element is transposed* as illustrated in **Figs. 1b** and **9**. By using a continuation of the element centers, you eliminate an extra splice.

An odd number of elements is recommended, since this allows the 2-wire feeder to be connected directly (nontransposed) across the center (egg) insulators of the end elements (reference 18).

Also note that the rear of the center feeder is "fanned" or separated at the rear element (reference 18). This helps in keeping the two feeder wires separated on the longest rear (S1) span, especially important for lower frequency LPs. This precaution helps prevent the two feeder wires from becoming twisted or from touching during a high wind. Additional Lucite spacers between S1+S2 and possibly S2+S3 may be necessary for 40m, or even 20m. LPs. This can usually be determined after the LP is finally assembled at the 1.83m (6') level.

(3) After the elements are cut to the various lengths, they can be attached to the center Lucite insulators, starting with element 2. The connections from the elements to the feeders can be made after all elements (except the rear and forward elements) are secured to the center insulators. *Note that every other element is transposed, i.e., element 1, nontransposed; #2 transposed; #3, nontransposed ... etc.; or all even number elements transposed and all uneven numbers nontransposed.*

Fig. 11 illustrates the Lucite center insulator, the transposed and nontransposed method of connecting the

element center ends to the feedline, and the method of connecting the feeder to the short forward element and the long rear elements which use the egg strain insulators.

(4) After the elements (except forward and rear) are attached to the center insulators and in turn connected to the feeder, all joints can be soldered while the center feeder is still elevated 1.83m (6').

The ends of the center feeder can now be removed from the 1.83m (6') supports and lowered to the ground. The feeder can now be attached to the rear and forward elements and soldered. Spread the complete LP on the ground at its approximate location (when aimed in the desired direction) between the four masts (DLP type) from which it will be suspended.**

Nylon catenary support lines

The DLPs used here are supported by two catenary side lines shown in **Figs. 4** and **6**.

These are stretched between masts A-C and B-D and the LP suspended between these. Nylon line, 0.32cm (1/8"), is used. Next, 0.48cm (3/16") nylon is used for supporting the long rear element, #1, and the short forward element as shown in **Figs. 4, 6, and 9**. Nylon does not shrink when wet or stretch when dry as does most rope. Further, nylon will not rot and should last several years. After four years in constant use here [in 1975 — ed.], none of the nylon line has broken.

The next step is to suspend the LP between the two catenary side lines.

At this point the LP has been assembled and is spread out on the ground between the four masts or other supports, aimed in the beam direction. It should now be raised 1.83–3.05m (6–10') above ground level and suspended at this height between the masts to be used in its final full height position. By using these masts, all

**For some of the LPs, I have used monofilament fish line (40 or 50 lb. test) in place of the Lucite end-insulators to reduce weight, cost, and fabrication time. The line used was Sears Cat. No. 6KV32232 (40 lb. test).

angles and distances will be the same as when the LP is hoisted to its maximum height.

The long rear element, #1, and the short forward element are attached to the 0.48cm (3/16") nylon line which supports the rear element between supports A & B. The short element is stretched between C & D.

The 0.32cm (1/8") side catenary lines or bridles are now stretched between A & C and B & D. Actually, these are supported A–B and C–D. However, these splices will be near the masts; the 0.48cm (3/16") lines carry all the load and will be tied to the mast halyards.

Next, add the Lucite end-insulators to all elements except #1 and the short forward element. These use the egg strain insulators.

Now, starting with element #2, tie short lengths of #18 (165-lb. test) nylon cord to the end insulators. These will in turn be tied to the side catenary lines. A–C and B–D. Element #2 will then be suspended between the side bridles.

When first tying these element support cords to the catenaries, make a knot which can be easily untied. It may be necessary to adjust the tension on the various elements several times before they are correct and the catenary lines start taking their proper "suspension bridge" shape as shown by **Fig. 4, 6, or 9**.

Elements #1 and #2 should be parallel, by making certain that their end spacings are equal to the center spacing, S1. After element #2 has been attached and adjusted parallel with #1, proceed to suspending and adjust element #3 and the following elements, #4, #5, etc., until all are suspended between the side bridles. As these are attached, the catenaries will start taking on the shape of a commercial LP.

Adjusting the tension of the elements between the side lines is the only "cut-and-try" procedure required for the LP assembly. When constructing your first LP it may require several tries but it will soon assume the correct shape illustrated by **Figs. 4, 6, or 9**.

Note: All elements other than the rear #1 and the short forward element will have some sag. This does not

seem to affect the operation. If the elements are pulled too tight between the side support lines (to try to level the elements), too much strain will be placed on the side lines, possibly requiring larger line and even sturdier masts.

There will also be some sag of the center feedline sagging toward the center. This shows no ill effect in the LP's operation. Some sag or "give" in all elements (except the long #1 and the short forward element) is desirable. If all lines are too tight, they might break during heavy icing conditions.

None of the LPs here has come down over the past four years. During this time there have been three heavy icestorms. The LPs sagged almost to the ground from the ice build-up. As soon as it melted, they returned to their normal height. They have also withstood several high winds without damage.

After all element support cords (#18 nylon) have been adjusted (and readjusted) several times so the sag of these is approximately the same, all elements parallel, and the side lines appear identical and have a similar catenary "curve" as in **Fig. 4**, the cords can be secured permanently to the side lines.

I suggest that a few turns of 2cm (3/4") masking tape be served on the 0.32cm (1/8") side lines on either side of the #18 nylon support cords. This will prevent the latter from sliding out of place along the side lines after the antenna has been raised.

Before raising the LP to normal height on the masts, an SWR should be run while the antenna is still 6 to 10 ft. above ground. Proceed as follows.

Feeding the log periodic

The simplest method of feeding the LP is to connect the high impedance balance winding of a 4:1 broadband balun at the feedpoint (short element end). The coax is then connected to the balun. Two other feed methods will be presented later, but the 4:1 balun method is the easiest for running the initial SWR before raising the LP to full height.

A low-powered transmitter or trans-

ceiver should be placed on a box or table directly under or a short distance in front of the short element feed end. Connect a short length of coax from the 4:1 balun to the SWR meter and another short length to the transmitter or transceiver.

An SWR run should be made over each of the bands for which the LP has been designed to cover. Readings should be taken at least every 100 kHz over each band. Record these for comparison with a second SWR run to be made after the LP has been hoisted to full height and the final length coax used between the antenna and the shack is positioned.

While the LP is still at a workable height, it is interesting to check the element ends for RF voltage on each of the bands. Either a small 1/4 watt neon or a "sniffer" can be used. This test will give one a better idea as to the operation of the LP.

If the SWR readings are 2:1 or better, the LP should be OK after it is raised to full height. Generally the SWR readings will improve after being raised higher above ground. They should then be similar to the SWR examples given by **Table 1** (and reference 18).

Other feed methods

The feed method mentioned above using a 4:1 balun directly to coax is the simplest and is recommended. However, two other feed systems can be used:

(1) Tuned open line from the shack directly to the LP feedpoint. This, of course, requires a tuner at the shack which must be returned when changing bands. The tuner with open line is OK for a monoband LP but is a nuisance when more than one band is used.

(2) 300Ω TV flat line can be used from the LP feedpoint to the shack, then the 4:1 balun and coax to the set. This is the method used here. Since trees are used as "masts," RG-8/GU or RG-11/U coax is too heavy, causing the LPs to sag. The 300Ω TV line seems entirely satisfactory for low power "bare foot" operation. Further, the TV line has extremely low loss if properly terminated and is quite inexpensive for

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long runs. Some of my LPs use over 107m (350') of TV line between the LP feedpoint and the 4:1 balun.

After the final method of feed is selected, it can be connected permanently to the LP feedpoint.

The beam is now ready to be hauled up to maximum height by the mast halyards. After the LP is in place, another SWR should be run over each band and compared with those run at the lower level. They should not exceed 1.5:1 over any band (or any frequency within its bandwidth, if necessary test equipment is available to make measurements outside the ham bands).

A doublet at the same height and broadside to the LP's beam should be used as a "standard" or test antenna for comparing gain in the forward direction.

Monopole log periodic assembly

The assembly and erection of the monopole LP configuration is similar to the DLP. **Fig. 8** illustrates the general construction for either a 7.0–7.3 or 3.5–4.0 MHz monoband monopole LP. **Fig. 10** gives element lengths and spacing distances for 40m and 80m.

A single catenary line is run from the high rear mast to the shorter forward mast; 0.64cm (1/4") nylon line is suggested. The 5 vertical elements are suspended from the support line. Note the "suspension bridge" shape of the catenary illustrated by **Figs. 2** and **8**.

The short forward mast should be a wood pole or any other nonmetallic support since it is directly in the line of fire of the vertical beam.

Note that the ground radials decrease in length from the rear end (below the longest rear vertical reflector, element #1) to the #5 forward element, the radials being the same length or slightly longer than their $1/4\lambda$ vertical elements.

The radials should be about 3.05m (10') above ground to allow access under them. Although the radials can slant down from the center feeder, the ends should be high enough to prevent contact as some are quite "hot" with RF.

The 2-wire feedline is identical to

the DLP type; however, the elements connected to and supported by the Lucite center insulators (**Fig. 11**) are arranged differently in that the two outside holes are for the two $1/4\lambda$ side radials and the center hole is for the $1/4\lambda$ vertical element. Actually the center insulator and the 2-wire feeder are suspended by the 5 vertical radiating elements and they in turn by the single catenary line. **Fig. 10** illustrates these elements, showing the jumper connection between the two side radials. Transposition or the "criss-cross" feed is accomplished as illustrated in **Fig. 10**.

The suggested method of feed is by the 4:1 balun, then to coax. Be sure the coax shield is grounded to an earth ground as near the balun as possible.

For these monoband monopole LPs, the #2 or $1/4\lambda$ "active" radiator is approximately $1/4\lambda$ from the balun feedpoint. This $1/4\lambda$ line provides a matching stub between the low impedance feedpoint of the #2 element and high impedance at the feedpoint which is probably in the order of 200–300 Ω , making a good match to the input of the 4:1 balun.

Summary

I believe anyone having observed the gain of the LPs used here will agree as to their effectiveness. When using the 17-element 20-15-10m West beam (LP #11) on 20m, W6s often report "strongest W4 on the band at this time." Considering that many of the other W4s are using the legal limit with rotary beams, a report of this type is encouraging.

I wish to thank the many hams who have assisted by reporting the readings taken on the various LPs tested here over the past four years and hope these tests will be beneficial to others. I especially wish to thank YV5DLT for his many reports on the 20m and 15m LPs; also, W4QS and K4FBU for their observations during the 40m tests for the past year.

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Continued on page 57

Inside the Wristlinx X2X FRS/GMRS Wristwatch Communicator

... where our ace reviewer has the time of his life.

Bet you think your snazzy new HT is small. Heck, the keypad's barely big enough for your fingers, right? Well, wake up and greet the 21st century, because now you can have a real, useful UHF 2-way radio on your wrist.

Yes, it's sci-fi come to life! The Wristlinx X2X Family Radio Service (FRS) Communicator from Xact Communication is an amazing little product. And, despite its low price, this radio is no toy.

Why should a ham care about FRS? From what I see at hamfests, it looks like we care a great deal. These days, I see more FRS HTs than ham ones at many 'fests. FRS is perfect for keeping in touch with the spouse and kids who aren't yet licensed as you wander the aisles, looking for that bargain of the century. If you've ever tried to juggle two HTs, though, you know how hard it can be to stay on the ham bands and FRS at the same time — especially when you're trying to keep at least one hand free for cherrypicking or hauling your latest find. This little gem neatly solves that problem.

Basic features

As wristwatches go, this one is somewhat bulky — as you might expect. It looks geeky, mostly due to the cartoonish speaker grille. You probably won't want to wear this thing to business meetings, but it sure beats carrying an FRS HT when you need comms with the family.

This incredibly small FRS/GMRS transceiver offers all 14 FRS plus 8 GMRS channels. It has automatic receiver power saving, just like a ham HT. It scans and it even has VOX, which can be used without an external headset. If you want one, though, there's a jack for it, and the company offers a headset at low cost.

The radio has all the usual FRS

features, including the ubiquitous and annoying call tone. At least it's not tagged on the end of every transmission, as it is with many FRS radios. To use it, you press the PTT twice in rapid succession. On the left side of the case are the power and scan buttons. The power button doubles as a menu selector, but don't worry — there are only two menus, each just one level deep,



Photo A. Wristlinx X2X FRS/GMRS Wristwatch Communicator.

making this a very easy radio to operate. On the right side are the up and down buttons used to change channels and volume level, and the combination charge/headset jack. Yup, the charger plugs into the headset jack! It seems like a strange idea, but it works fine. After all, you're never going to want both of those things plugged in at the same time anyway, and they had to save space somehow.

The mic, speaker, and PTT are on the front, below the display. Channel and operating status (TX, RX, call, volume level, and low-battery indicator) are in the upper section of the LCD, with time at the bottom. Pressing any button lights the display nicely for about 5 seconds.

The antenna is a one-inch rubber duck (yes, one inch!) which flips up for operation and folds down neatly when you're at close range or not using the radio. Despite its diminutive size, it works amazingly well, and flipping it up makes a huge difference in the radio's performance.

Squelch is automatic, with no adjustment possible. There are no "quiet code" subtones.

The case and band are plastic. With the battery installed, the whole shebang weighs about four ounces, but the feel is solid and not toylike at all. The band has an especially clever locking mechanism for a secure fit. The package

includes the watch, battery, charger, and instructions.

Power to go

When I first saw this radio, I assumed it was a low-power kiddie gadget that might make it across the front yard if the wind were blowing the right way. How wrong I was! This baby puts out the full 500 mW allowed on FRS, just like a full-size FRS HT, and has a stated range of 1.5 miles!

How in the heck do you power a transmitter like that on a wristwatch? As with most of today's tiny gadgets, from cell phones to camcorders, the answer lies in lithium ion technology. The X2X uses a 3.7-volt, flat lithium battery which fits in the back and can easily be replaced by the user. Here's the kicker: This tiny battery is rated at 540 milliamp-hours, for a total of nearly 2 watt-hours. That's a lot of juice!

Getting started

After installing the battery, the time shows up on the display, and you press the power/menu button a few times to set it. It's easier than on many watches. To turn the radio on, you hold the same button for a few seconds. The radio status indicators pop up, a few tones sound from the speaker, and you're ready to go.

The right-side buttons normally control the volume, the level of which is shown on a little graphic on the LCD, but you also use them to change channels by first hitting the menu button. The channel numbers blink, indicating that they will change instead of the volume.

Performance

Receiver sensitivity is nothing short of astounding. There's no spec given for it, but this thing hears signals with its one-inch antenna that my full-size FRS HT can't. In fact, it's almost as sensitive as my Yaesu VX-5R is with that rig's full-size duck. I suspect that the tremendous RX sensitivity accounts for the good range, making up for what must be a very lossy transmitting antenna.

The transmitter does get out, though. I've talked to people a mile away, and the reports were good. The TX audio is excellent and indistinguishable from the sound of a bigger radio.

Alas, the same cannot be said for the receive audio quality. There's just no nice way to put this: it's atrocious. The tiny speaker is very tinny, and there's a lot of distortion even at low volume levels. Above moderate levels, clipping is so bad that you might not be able to understand what someone is saying, especially if the transmitting radio has very hot modulation. (The watches keep their own TX modulation low, probably for this reason, and they don't sound as bad when used with each other.) Keeping the RX volume down does help a bit, though.

While much of the receive audio problem is undoubtedly due to the speaker, not all of it is. I listened through a headset, and there was still plenty of fuzziness. Still, it was a lot better than with the speaker.

The squelch does a good job of keeping out noise but opening for weak signals. It pops horribly, though, making headset use uncomfortable. There doesn't appear to be any hysteresis, either, so very weak signals and sometimes auto ignition noise make it pop rapidly.

The VOX is weird but somewhat useful. What's weird is that, contrary to what's stated in the manual, speaking normally won't turn it on. In fact, shouting at the watch usually won't either! At first I thought my radio must be broken, but they're all like that. What does work well is to blow a short puff of air into the mic hole. That turns the VOX on reliably, and it stays on if you talk normally after the puff. I suspect Xact did it this way on purpose, so that typical arm movements, and perhaps a sleeve rubbing on the rig, wouldn't put it into transmit, killing the battery and annoying other FRS users. It does take some getting used to, but it's great when your hands are full and you can't reach the PTT button. In fact, it makes sense to leave the VOX on all the time, since the PTT still works in that mode. You sure don't have to worry about accidental transmissions!

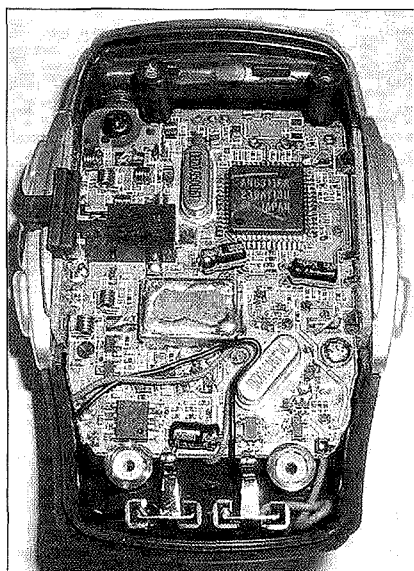


Photo B. Inside view.

The rig will scan all 22 channels, stopping for five seconds when the squelch opens and then resuming regardless of whether there's still a signal on the frequency. As with most FRS radios, you can't lock channels out or do any of the other fancy scanning tricks we're used to with our ham rigs. Scan speed is not overly fast, but I've seen slower.

Unfortunately, when you stop the scan, it returns the rig to the original channel you were on before scanning, not the one you're on at the time it stops! That makes it annoying when you hear something and want to join in; you have to hit the menu button and then advance the channel to get where you wanted to be. There is an undocumented feature, however, which helps in this situation: If you press the PTT, the scan wait becomes much longer, staying on the frequency for about 10 seconds after the squelch closes before resuming scan, and resetting that timer each time you transmit. So, you can carry on a short conversation while in scan mode, but I still wish canceling the scan would leave the radio on the last channel scanned.

The battery lasts a long time. I measured transmit current at 300 milliamps, so, even key-down, the rig should transmit for a good hour and a half or more on a full charge. Not many ham HTs can do that. (Of course, I don't recommend you try it, as you will probably overheat the final transistor, just as you would in your other HTs. FM handhelds aren't built for continuous-duty-cycle use.) In normal, active use, the battery seems to do fine. I've played with my rig (can you really call a wristwatch a "rig"?) all day and still haven't seen the low-battery indicator. With lithiums, there's no memory effect, so you can charge the battery up when you're done for the day, regardless of how much power is still in it. And, if you want an extra battery, the company offers them for \$13, which is very reasonable for a flat lithium cell.

GMRS

GMRS, the General Mobile Radio Service, is intended for business and

family use, and requires an FCC license which costs more than a pair of these radios. Yet, many new FRS sets are including GMRS channels, and some even put out a few watts on those frequencies while dropping back to 500 mW on FRS. Given the widespread inclusion of GMRS on so many consumer radios, some people probably use the licensed frequencies illegally, since the low-power transmissions are unlikely to bother anyone or even be heard. I can't recommend you do that, of course. The Wristlinx includes a reference to the FCC Web site, so you can see about getting a license if you want to use the GMRS channels. Since there's no way to disable those channels on the Wristlinx, their presence raises a problem with giving the radios to children, who would otherwise be prime customers for them. Who's legally responsible if your kid gets in trouble for unlicensed GMRS operation? I'm guessing you, the parent.

Those little nitpicks

The front of the package states that the radio puts out 500 mW. The specs in the instruction booklet, however, state that it's 0.3 W ERP. Actually, both may be true; the tiny antenna may be lossy enough to reduce the 500 mW output to 300 mW effective radiated power. Still, the transmitter has plenty of power and gets heard.

There's no monitor button to open the squelch. Especially given the lack of squelch hysteresis, it'd be nice to be able to force it open for weak-signal reception. I'd have preferred if the scan function, which typically isn't used that much, had been moved to the menu and the button had been used for a monitor. Or, perhaps, a quick press of the button could start the scan, while holding it down opened the squelch.

During scan, the up and down buttons change the scan direction instead of the volume. To adjust the volume, you have to stop the scan first.

The battery indicator only comes on when the battery is nearly dead. It's not a multisegment meter, even though it looks like one. A real meter would

have been very welcome. The same indicator comes on while charging and then disappears when charge is complete, which is nice.

This is clearly a radio that also tells time, not a watch that also communicates. The timekeeping function is extremely limited, with no date, day, stopwatch or any other fancy watch functions. And, if you carry an extra battery and change it during long periods of use, the time is lost and must be reset. You can't even back light the watch when the radio is off.

That battery is really small, flat and cool, but it's hard to remove from the radio! It won't come out with your fingers; using a corner of the removable battery cover to pry it out works, but it's still not easy.


Conclusion

Complaining about these mostly minor details is like saying, "My monkey plays the piano pretty well, but he hits a few wrong notes!" Even with the substandard receive audio, this is an absolutely amazing sci-fi dream of a gadget, and it's cheap, too! A 2-way radio that can go more than a mile and fits on your wrist — we live in interesting times, don't we? Now if only someone can convert one of these to the 70cm ham band ... any takers?

Specs

Manufacturer: Xact Communication, LLC, 105 Madison Avenue, New York NY 10016; [www.xactcommunication.com].

List price: \$49.99.

Street price: \$29.00 at Wal-Mart. 

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Batteries to the Max!

An expert tells us how to get the most out of 'em.

A common difficulty with portable equipment is the gradual decline in battery performance after the first year of service. Although fully charged, the battery eventually regresses to a point where the available energy is less than half of its original capacity.

Rechargeable batteries are known to cause more concern, grief and frustration than any other component of a portable device. Given its relatively short life span, the battery is also one of the most expensive and least reliable parts. In many ways, a battery exhibits humanlike characteristics: It needs good nutrition, prefers moderate room temperature, and, with the nickel-based system, requires regular exercise to prevent the phenomenon called "memory."

How to restore and prolong nickel-based batteries

When nickel-based batteries are mentioned, the word "memory" comes to mind. Memory was originally derived from "cyclic memory," meaning that a nickel-cadmium (NiCd) battery could remember how much energy was required and would provide similar amounts on subsequent discharges. Improvements in battery technology have virtually eliminated this phenomenon. The modern term of "memory" refers to a crystalline formation that robs the battery of its capacity. Applying one or several full discharge cycles can commonly reverse this effect.

The active cadmium material of a NiCd battery is present in finely divided crystals. In a good cell, these crystals remain small, obtaining maximum surface area. Memory causes the crystals to grow, reducing the surface area. In advanced stages, the sharp edges of the crystals may penetrate the separator, initiating high self-discharge or an electrical short.

The effect of crystalline formation is most visible if a NiCd battery is left in the charger for days, or is repeatedly recharged without a periodic full discharge. Since most applications do not use up all energy before recharge, a periodic discharge to 1.0 V/cell (known as exercise) is essential to prevent memory.

All NiCd batteries in regular use and on standby mode (sitting in a charger for operational readiness) should be exercised once per month. Between these monthly exercise cycles, no further service is needed and the battery can be used with any desired user pattern without memory concern.

If no exercise is applied to a NiCd for three months or more, the crystals ingrain themselves, making them more difficult to break up. In such a case,

exercise may no longer be effective in restoring a battery, and reconditioning is required. Recondition is a secondary discharge that slowly removes the remaining battery energy by draining the cells to virtually zero volts. NiCd batteries can tolerate a small amount of cell reversal. During deep discharge, caution must be applied to stay within the allowable current limit to minimize cell reversal.

When Nickel-Metal Hydride (NiMH) was introduced in the early 1990s, there was much publicity about its memory-free status. Today we know that NiMH also suffers from memory, but to a lesser extent than NiCd. No scientific research is available that specifies optimal maintenance. Applying a full discharge once every three months appears right. Because of the shorter service life, over-exercising of NiMH is not recommended.

Simple guidelines for nickel-base batteries

- Do not leave a nickel-based battery in a charger for more than a day with the "ready" light on. It is better to remove the battery from the charger and apply a charge before use.

- Apply periodic discharge cycles. Running the battery down in the equipment may do this also — as long as the pack is not discharged below 1.1 V/cell.

- It is not necessary to discharge the battery before each charge. This would put undue stress on the battery.

- Avoid elevated temperature. The battery should cool off and remain at ambient temperature after full-charge.

- Use high-quality chargers.

The effect of zapping

Remote control (RC) racing enthusiasts have experimented with all imaginable methods to maximize battery performance. One technique that seems to work is zapping the cells with a very high pulse current. Zapping is said to increase the cell voltage by 20 to 40 mV under a 30 A load. According to experts, the voltage gain is stable; only a small drop is observed with usage and age.

During the race, the motor draws 30 A from a 7.2 V battery. This calculates to over 200 W or close to a quarter HP of power. The race lasts about four minutes.

According to experts, zapping works best with NiCd cells. NiMH cells have been tried, but the results are inconclusive. Zapping is done with a 47,000 μ F capacitor charged to 90 V. Best results are achieved if the battery is cycled twice after treatment, and then zapped again. Once in service, zapping no longer improves the cell's performance. Neither does zapping regenerate a cell that has become weak.

Companies specializing in zapping batteries use top-quality Japanese-made NiCd cells. The cells are normally sub-C and are handpicked at the factory. Specially labeled, the cells arrive in discharged state with open cell voltages of 1.11 V to 1.12 V. If below 1.06 V, the cell is suspect, and zapping does not work well.

There are no apparent side effects to zapping, but the battery manufacturers remain noncommittal. No scientific explanation is available, and only little is known on the longevity of the cells after treatment.

How to prolong lithium-based batteries

Battery research is focusing heavily

on lithium chemistry — so much so that you might presume that all future batteries will be lithium systems. In many ways, the Lithium-ion (Li-ion) is superior to nickel- and lead-based chemistries.

A Li-ion battery provides 300 to 500 discharge/charge cycles or two to three years of service from the time of manufacturing. The loss of battery capacity occurs gradually, and often without the knowledge of the user. There are no remedies to restore Li-ion batteries when worn out.

Li-ion prefers a partial rather than a full discharge. Avoid depleting the battery fully. Instead, charge more often or use a larger battery. There is no memory to worry about.

The aspect of aging is an issue that is often ignored. A time clock starts ticking as soon as the battery leaves the factory. The electrolyte slowly "eats up" the positive plate, causing the internal resistance to increase. Eventually, the cell resistance reaches a point where the battery can no longer deliver energy, although it may still retain a charge.

The speed by which Li-ion ages is governed by temperature and state-of-charge. The most harmful combination is full charge and high temperature. If possible, store the battery in a cool place at a 40% charge level. **Table 1** illustrates the capacity loss as a function of temperature and charge level.

Simple guidelines for Li-ions

- Avoid full discharges; recharge Li-ion more often. There is no memory to worry about.

- Although memory-free, apply a deliberate full discharge once every 30 days on batteries with fuel gauge to calibrate the battery. If not done, the fuel gauge will become increasingly less accurate.

- Keep the Li-ion battery cool. Never freeze the battery. Avoid a hot car.

- For prolonged storage, keep the battery at 40% charge level.

- Avoid purchasing spare Li-ion batteries for later use. Observe manufacturing date. Do not buy old stock, even if sold at clearance prices.

How to restore and prolong lead-acid batteries

The sealed lead-acid battery, known as valve-regulated lead acid (VRLA), is designed with a low overvoltage potential. This is done to prevent water depletion. Consequently, these systems never get fully charged, and some sulfation will develop over time.

Finding the ideal charge voltage limit is critical. Any voltage level is a compromise. A high voltage limit produces good battery performance but shortens the service life due to grid corrosion on the positive plate. The corrosion is permanent. A low voltage protects the battery and allows charging under a higher temperature but is subject to sulfation on the negative plate.

Restoring a sulfated battery is difficult and time-consuming. One method that provides reasonably good results is applying a charge on top of a charge. This is done by fully charging a battery, then removing it for a 24 to 48 hour rest period and applying a charge again. This process is repeated several times and the capacity is checked again with a full discharge. The lead-acid battery is able to accept some overcharge, but too much causes corrosion and loss of electrolyte.

Applying an overvoltage charge of up to 2.50 V/cell for one to two hours can also reverse sulfation. During treatment, the battery must be kept cool, and careful observation is needed. Prevent venting. Most plastic

Temperature (degrees C.)	40% charge level after one year (recommended storage charge level)	100% charge level (typical user charge level)
0	98%	94% after 1 yr.
25	96%	80% after 1 yr.
40	85%	65% after 1 yr.
60	75%	60% after 3 mos.

Table 1. Permanent capacity loss of Li-ion as a function of temperature and charge level. High charge levels and elevated temperatures hasten the capacity loss. Improvements in chemistry have increased the storage performance of some Li-ion batteries.

VRLA batteries vent at 34 kPa (5 psi). Not only do escaping gases deplete the electrolyte, but they also are highly flammable (hydrogen gas).

Sealed lead-acid batteries are also available in cylindrical form. The Cyclon by Hawker resembles an oversized D-size cell. If sulfated, applying an elevated charge voltage commonly reactivates the cell. Initially, the cell voltage may rise to 5 V, absorbing only a small amount of current. In about two hours, the small charging current converts the large sulfate crystals back into active material. The internal cell resistance decreases and the charge voltage normalizes. When within 2.10 V to 2.40 V, the cell starts to accept normal charge. If the sulfation is advanced, this remedy does not work and the cell needs to be replaced.

When applying overvoltage, current-limiting must be utilized. Always set the limit to the lowest practical setting on the power supply and observe the battery voltage and temperature during charge.

Improving the capacity of an older lead-acid battery by cycling is mostly in vain. Such a battery may simply be worn out, and cycling wears it down further. The lead acid battery is not affected by memory.

VRLA batteries are commonly rated

at a 20-hour discharge. Even at such a slow rate, a capacity of 100 percent is difficult to obtain. For practical reasons, most battery analyzers use a 5-hour discharge when servicing these batteries. This typically produces 80% to 90% of the rated capacity. VRLA cells are normally overrated and manufacturers are aware of this practice.

Simple guidelines for lead-acid batteries

- Always store lead-acid charged. Never let the open cell voltage drop below 2.10 V. Apply a topping charge every six months or when recommended.

- Avoid repeated deep discharges. Charge more often or use a larger battery.

- Prevent sulfation and grid corrosion by choosing the correct charge and float voltages.

Battery recovery rate

Restoring batteries by applying controlled discharge/charge cycles varies with chemistry type, cycle count, maintenance practices, and age of the battery. The best results are achieved with NiCd. Typically, 50 to 70 percent of discarded NiCd batteries can be restored when using the exercise and recondition methods of a Cadex battery analyzer or equivalent.

Not all batteries respond well to exercise and reconditioning. An older battery may show low and inconsistent capacity readings. Another battery may get worse with each advancing cycle. An analogy can be made to a frail old man for whom exercise is harmful. Such a condition suggests battery replacement.

Some older NiCd batteries recover to near-original capacity when serviced. Caution should be applied when rehiring these old-timers because of possible high self-discharge. If in doubt, measure the self-discharge. A 10 percent self-discharge in the first 24 hours after charging is normal. Discard the battery if the self-discharge approaches 30 percent.

The recovery rate of NiMH is about 40 percent. The lower yield is in part due to the reduced cycle life. Some

batteries may exhibit irreversible heat damage suffered by incorrect charging. Elevated operating and storage temperatures also contribute to permanent capacity loss.

Lithium-based batteries have a defined age limit. Once the anticipated cycles have been delivered, no method exists to restore them. The main reason for failure is high internal resistance caused by oxidation. Operating the battery at elevated temperatures will momentarily improve the performance. However, the high internal resistance will revert to its former state when the temperature normalizes.

Many Li-ion batteries for cell phones are being discarded under the warranty return policy. Dealers have confirmed that 80 to 90 percent of these batteries can be repaired with a battery analyzer. Because no equipment is on hand, the batteries are often sent back to the manufacturers or are discarded without any attempt to restore them.

Some Li-ion batteries fall asleep if discharged below 2.5 V/cell. The internal safety circuit opens and the charger can no longer service the battery. Advanced battery analyzers feature a boost function to activate the protection circuit enabling a recharge. If the cell voltage has fallen below 1.5 V/cell and has remained in that state for a few days, a recharge should be avoided because of safety concerns.

The recovery rate for lead-acid batteries is a low 15 percent. The reasons for the low yield may be due to incorrect charging methods, high cycle count, operating at elevated temperatures, and old age.

The question is often asked about whether a restored battery will work as well as a new one. The breakdown of the crystalline formation on NiCd can be considered a full restoration. However, the battery will revert to its former state if the required maintenance is denied. If the separator is damaged by excess heat or marred by uncontrolled crystalline formation, that part of the battery will not improve.

Continued on page 57

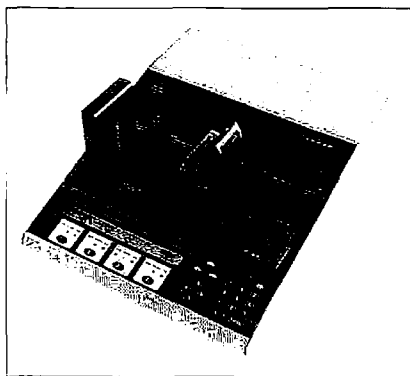


Photo A. The Cadex 7400 programmable four-station battery analyzer has a range of 1.2 V to 16 V and 100 mA to 4 A. Each station operates independently. Custom battery adapters simplify battery interface; universal adapters accommodate less-common batteries. Nickel-based batteries are automatically reconditioned if the capacity falls below the user-defined target capacity.

A Sorry Solder Tale

If you're a masochist, figuring out how to bulk-solder will be great fun.

I've always enjoyed building electronic circuits. Point-to-point wiring, wire-wrap, or using a PC board, it's always fun. But what happens when the fun becomes work? That's what happens when a small project grows out of control. Like it or not, when a published project becomes popular, it's no longer fun.

A little background: I own a small three-person company called Sunlight Energy Systems. We sell solar electric modules and do system design work. We also design and sell several models of charge controllers. One of our circuits appeared in the October 2001 Issue of *QST* magazine. The article is called the "Micro M Plus."

The Micro M Plus is not a new product for us. It's been around a while and we manage to sell a few hundred each year. Each one is hand-assembled and then calibrated. On a rainy Saturday afternoon, I can easily assemble a dozen or so with enough time left over for some 30-meter CW work, too.

As a company we don't advertise much. Most of our sales are through word of mouth. With that said, we started picking up sales from several customers who were putting the Micro M Plus into solar-powered wellhead monitors. We slowly started to see an increase in Micro M Plus sales. Now, I had to spend sunny Saturday afternoons stuffing PC boards and soldering in parts. After a very short while, it was no longer fun anymore!

Increasing production

Instead of using my old circuit board holder that held about three boards at a time, I needed something a bit bigger. I located a PC board rack. A rack is nothing more than an aluminum frame with aluminum rails that hold the PC boards. This particular PC rack will hold 38 of the Micro M Plus PC boards at a time.

Stuffing all those parts into the PC boards is hard work. It's also very tedious work. I can do one rack in about four hours, with dozens of breaks to keep me from going batty. I have my wife do most of the part stuffing. She can do that for hours on end without trouble.

After the boards are stuffed, a cover is mounted over the top of the boards. The top cover is lined with foam rubber and that holds the parts in place. You flip the rack over and solder the parts in.

Sounds simple. But guess what, it's not. When you flip the rack over, you're looking into the bottom of 38 PC boards stuffed with parts. What you see is all those resistor leads looking up at you. It does not take too long to figure out you can't get the

soldering iron tip down into that mess to get to the board to do the soldering. So, what you end up doing is clipping off the leads to a length of about 3/8 of an inch long. Now you can solder the leads. Of course you must now go back and trim the leads flush to the PC board. That's one more step added to the process.

Just imagine doing this over and over again. After a while, it's no longer fun; it's becoming work. Then out of the blue I get a call from a company wanting a quote on 258 Micro M Plus controllers. I had to find a better way of putting these together.

Assembly of electronic printed circuit boards

I decided that 258 are way too many for us to do by hand all at one time. So, a quick search on the Internet for "electronic assembly" turned up pages of companies that put things together. Trouble is, they don't do it for nothing.

And, to top things off, they won't talk to you unless you want zillions done every month. OK, maybe not zillions, but I did hear figures of at

Continued on page 36

A Sorry Solder Tale

continued from page 35

least 1,000 per month minimum runs. Most were looking at 5,000 pcs per month. Don't I wish!

There are several ways to assemble printed circuit boards. The first one is of course by hand. In fact, some of the companies I talked to that would do small runs did exactly what I have been doing. The printed circuit board is stuffed and assembled by hand. The boards were then soldered one at a time by hand.

The second method is also done by hand. It's called stuff and push. Here's how it works. Imagine a railroad track that holds a single PC board or a single panel of PC boards. (A panel consists of many single PC boards held together as one. Breaking off the tabs holding them in place separates the boards from each other.) The track runs from one operator to the next. The first operator stuffs in, say, four resistors. She then pushed the board down the track to the next operator, who then stuffs in her parts. This operator pushes the board off to the next operator and so on. When the board reaches the end, it's fully populated and ready to be soldered.

The third method is called auto insertion. Here a machine takes taped components and bends/cuts them before stuffing the part into the PC board. The

whole operation is untouched by human hands and is very, very fast. There are many guidelines that must be followed such as hole spacing and part location before the machine can be used. It's also not a simple matter of programming the machine to your job. This all equals a lot of money, and thus these auto insertion machines are only used for large jobs that require thousands of boards.

The last method is known as pick and place. Normally you don't see this type of equipment used in through-hole board assembly. Pick and place machines live in the world of surface mount components. And like the auto insertion machines, they need to be programmed so they know what part goes where.

On a side note, I have learned that some of the very high-end printed circuit layout CAD programs can generate the required data so either type of these machines can be quickly set up.

It's not the parts; it's the soldering

I really don't have a hard time stuffing parts into the circuit boards. In fact, my wife seems to enjoy it. What takes the time is the soldering.

Aside from hand soldering, there's wave soldering, wave pot soldering, dip soldering, ultrasonic soldering, thermal soldering, and solder pot soldering.

Wave soldering

Wave soldering involves moving the printed circuit board across a wave of molten solder. As the board moves past the wave, the molten solder touches the bottom of the board and solders the parts as the board passes through.

In a wave soldering machine, the PC boards enter on one end and travel down an incline toward the solder wave. Before the solder wave, the boards are usually cleaned and then dried. After the boards have dried, liquid solder flux is applied. The flux can be sprayed on or the board dipped into the flux. However, most of the newer machines have a flux foamer.

A flux foamer is really rather simple. Air bubbles are piped into the flux, creating bubbles of flux to be formed. The bubbles travel up a tube or channel and are allowed to flow up and over the pipe. The boards then are passed through the flux bubbles!

The board is then preheated using either quartz or infrared heaters. The now-preheated boards are then passed over the liquid solder wave, soldering the parts in. The board is then usually cleaned or defluxed and cooled. The board then goes to a final inspection station, where any solder bridges or missed connections are fixed.

This is more or less how a wave soldering machine works. Some machines do more, some do less. Some machines preheat the board before applying the flux; some apply the flux before preheating.

The amazing part of a wave soldering machine is the solder wave. Here's how it's done. To imagine the solder wave, take a garden hose and attach a fan-watering head. Turn on the water. Now tilt the head to one side, the water will fan out of the head rise up, and then fall down toward the ground. At the knee of the water, or the top part as it just starts to fall over is the wave.

That, in a nutshell, is how a wave of solder is generated. Molten solder is pumped through an opening that creates the wave. The slick thing is that the opening can be fan-shaped to cover all the board or round to only solder certain places on the board. This selective soldering is used when

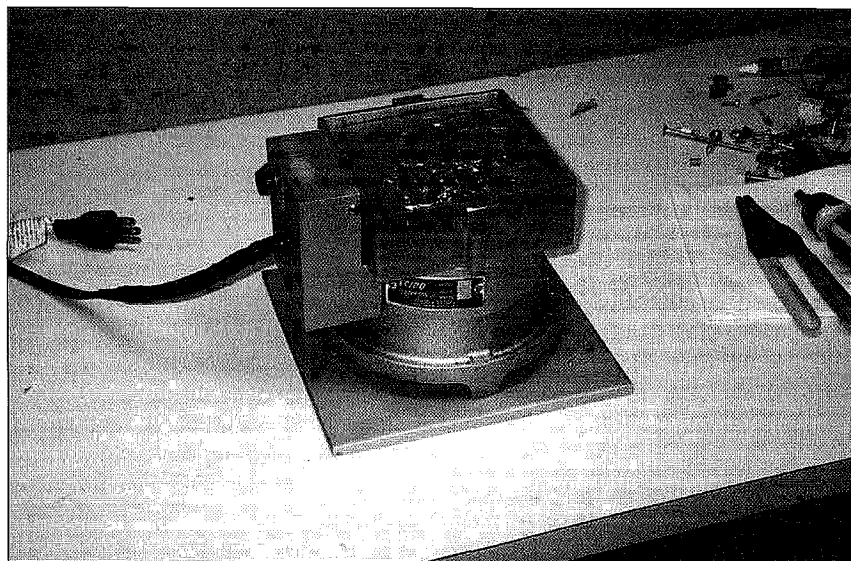


Photo A. Here's the solder pot getting ready for another job. Notice the ceramic tile on the table. This keeps the hot solder pot from burning the tabletop.

boards have mixed technologies such as surface mount and through-hole components.

As slick as a wave soldering machine is, it's not something you find at your local Wal-Mart. A wave soldering machine consumes huge amounts of electricity. Most require three-phase electrical power. You just don't fire one up to make three dozen boards!

Then, of course, there are the environmental problems of having all that solder — which of course contains lead. Some of these wave machines contain up to 500 pounds of solder. The flux is an acid that must be monitored. Let's not forget about all the fumes generated that must be vented to the outside.

And then there's the cost. A "used, repairable" wave soldering machine is about \$30k. There are cheaper tabletop units that start around eight grand.

The next step is a machine called a wave pot. A wave pot is a soldering pot with an internal pump that moves the liquid solder much like a wave soldering machine. Only in a wave pot, it's on a much smaller scale. Usually a wave pot is used for selective soldering on smaller boards.

But what is a soldering pot in the first place? Well a soldering pot is just what the name implies. It's a pot of liquid solder. Most of us have seen a solder pot in the catalogs from electronic supply houses. I've always thought the only thing you could do with a solder pot is pretin wire, by dipping the wire first in flux and then into the solder pot. While that is a big part of what a solder pot is used for, I also found out that there is something called dip soldering.

In dip soldering you dip your prestuffed printed circuit board into a pot of molten solder. It's almost like wave soldering, but without the wave. This is the process that I ended up using. Dip soldering is much more manual than wave soldering. All the labor must be done by hand. And, it's a much slower process as well.

Here's how I dip soldered my circuit boards

The first step is locating a solder pot

that could handle the size of boards I will be soldering. Most solder pots are round. The one I purchased is 4.5 inches square. It will hold about 12 pounds of solder. The model is the 75T, made by Eisco industries.

The next step is obtaining the necessary solder and solder flux. I use Kester Ultrapure 63/37 bar solder. Bar solder is rather expensive stuff and runs about six bucks a pound. It's also a traded commodity and thus the price changes daily.

I use Kester 945 no-clean solder flux. A one gallon container is about \$30. I applied the flux using a standard spray head from a used spray cleaner bottle. I purchased both the solder and solder flux from Techni-Tool.

One of the problems with both wave soldering and dip soldering is getting the boards ready for the molten solder. Places that you don't want soldered must be masked off. You can't use good old masking tape either. You need to use a peelable solder mask. This is a liquid material that goes on wet and dries semi-hard. It will resist the heat from the molten solder yet is easy to peel off of the circuit board.

The solder mask takes about 24 hours to cure. After the mask has cured, the boards are sprayed with flux. This stuff is nasty and spraying is not the best method to use, but so far for me it's been the easiest to do.

After the flux is applied, I preheat the board by holding it above the molten solder for a few minutes. Then the entire circuit board is pushed into the



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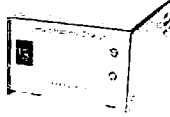
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vat of molten solder. I keep the board in the solder for about one or two seconds. I have found that by watching the plated-through holes, as soon as I see solder filling into the top holes, the board is done. At no time is the board in the solder more than two seconds.

The next step is to remove the board from the solder and check the results. In one second in the solder pot all connections are soldered. They are bright, shiny, and tight. I've found solder bridges between two pads on the board to be very rare.

The leads are clipped off and the board checked for errors. Usually a touch or two of the soldering iron will take care of any bridge that might have been made.

Lessons learned

Dipping the boards in by hand does not produce perfect results every time. I need to come up with some sort of jig to hold the boards as they go into the solder. If you tilt the board too much one way, there may be some spots that don't touch the solder and thus are not soldered.

Preheating the boards by holding them above the solder pot takes too long. Right now, I can only do one board at a time. Some sort of preheater

to heat up several at one time is in order. Perhaps some infrared lamps may do the job.

I have to come up with a better idea for applying the flux. I have been thinking of using a large tray and dipping the board into the flux. This would not be as messy as the spray I use now.

Other concerns

When you place a printed circuit board coated with liquid solder flux into a bath of molten solder, it gives off a lot of fumes. I really have to come up with some ventilation to keep fumes down.

When you have almost twelve pounds of molten solder; you have to really be careful. Other than the fact that it can cause really nasty burns, if spilled it will destroy anything it touches. And of course solder is mostly composed of lead, and lead is toxic.

The entire solder pot gets really hot! From the knob on the thermostat to the base itself, the whole shebang gets hot. So hot, in fact, that the first time I used the solder pot, it burnt four marks into the table it was sitting on. I think the fix may be as simple as a ceramic tile placed between the pot and the desk.

End results

All in all, I've been pleased with how the dip soldering has been working. Every time I use it, I get a bit better. Right now some sort of jig to hold the PC boards is on the drawing board.

Even without the jig, and just by hand dipping, I am able to do 60 boards in less than an hour. By hand, that many boards would have taken me a week of nonstop hand soldering.

Update!

Since I last put this together, I have put some of my own ideas to work. Using a large plastic food container solved the flux problem. Now the boards are dipped into the flux, allowed to drain, and then warmed over the hot solder.

The solder pot now sits on top of a ceramic tile. That works just great and keeps the tabletop from getting too hot from the heat of the solder pot.

I found an old circuit board holder. Its spring loaded jaws hold the PC boards in place, and because it's made of aluminum the solder won't stick to it. It's much faster than what I had originally used. The only trouble is that it gets hot after a while and you have to keep it cooled off or your finger starts to burn.

And like anything else, practice makes perfect. I can now solder all the boards in the board holder, 38 pcs, in about 15 minutes. In fact, it takes longer for the solder pot to get up to temperature than it does to get the job done!

So, now that I have a solder pot, I can solder!

73

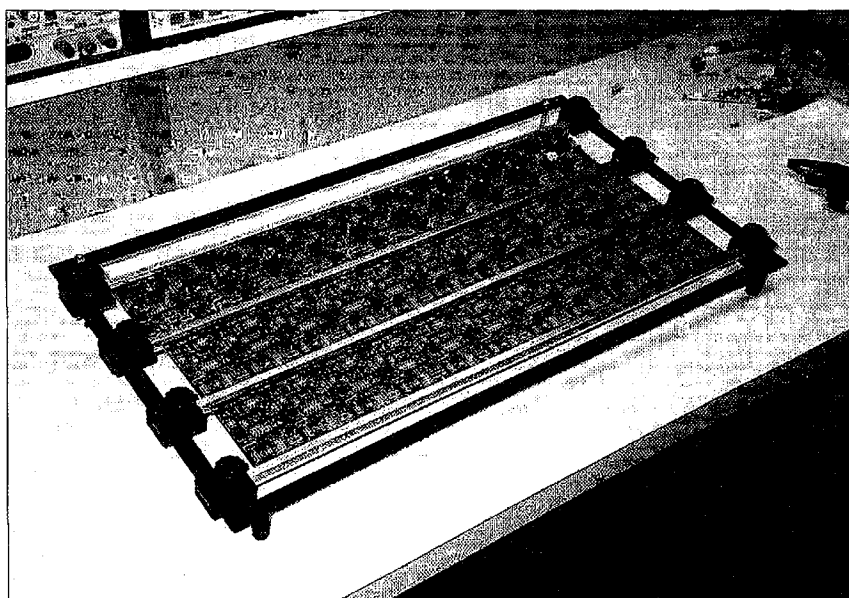


Photo B. Here's a rack of Micro M+ controllers being assembled. The rack will hold 33 PC boards. The top row of boards is already stuffed.

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Morse-by-Mouth

A unique way to master the Code?

Even with the de-emphasis on Morse code in amateur radio license testing, The Code remains a popular, much-used mode on the amateur bands.

Learning the code, or enhancing your existing ability doesn't have to be a gut-wrenching, migraine-producing, hair-pulling experience. In fact, when approached from the following radical angle, it can be fun and entertaining, as well as rewarding.

M-B-M ... A beginning

Morse-by-Mouth was developed back in the dark ages of amateur radio by a group of hams trying to have fun with a difficult proposition — how to increase their Morse code copying ability. After much unscientific (but heartfelt) study, some empirical experiences, plus the support of fellow loonies, it was agreed that you *can*, through the use of M-B-M, learn the code, increase your speed, get the job you've always wanted, marry the girl of your dreams, and live happily ever after. It's all in your "talkability."

Talking your way to success

If you got a lot of reprimands for talking in class, if your friends had to smack you upside the head with a slice of pepperoni pizza to get a word in, or if your daddy told you "Kid, you got a

big mouth!" — you're gonna love code talking!

With apologies to the valiant Navajo Code Talkers of WWII, *code talking* here refers to verbalizing Morse code — literally sounding out each Morse character — just as if your mouth was a CW transmitter. Okay? or **dah-dah-dah, dah-di-dah, di-di-dah-dah-di-dit**. Notice that we don't pronounce it as "dash-dash-dot-dash." This more literal translation is not only confusing, but it hampers your talk speed as well.

Sound like a goofy premise? Just bear with me for a bit and I promise you'll at least find this an interesting process.

The good old days — the way it was

I was a Novice back when things were a lot tougher — when to get your General class license you had to send and receive 13 wpm in addition to passing a written exam, under the watchful eye of a real FCC field engineer, who was armed. Tests were only administered at an FCC field office. Since none of our gang was old enough to drive, we had to get there the best way we could, which meant

bicycling or walking — several miles, usually uphill, through several feet of snow. Asking your parents to drive you was not an option.

During those formative years, I struggled along with my fellow high school radio club members to reach the 13 wpm level, while others were just trying to do the 5 wpm for their Novice tickets. It was slow going.

"Man, I'm never gonna bust that ten-words-per-minute hurdle," I complained to my buddy Walter after a code practice session.

"Hey, don't bitch," Walter says. "I'm still stuck at eight!"

Walking to class later that day with James, Walter asked him how *his* code speed was doing.

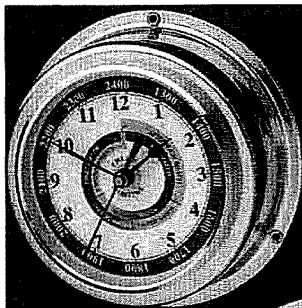
"**Di-di-dah-dit, dah-di-di-dit**" ("FB"), he responded.

We both chuckled over that. And James mouthed something else. "**Di-dah-dah-dah-dah, di-di-di-di-dit, di-dah-dah, di-dah-dah-dit, dah-dah**" ("15 wpm").

"No kiddin'," I said. "That's great!"

"Yeah, we're stuck at eight and ten," Walter said.

Walter and I looked at each other at the same instant, realizing that we'd just copied James' verbally produced



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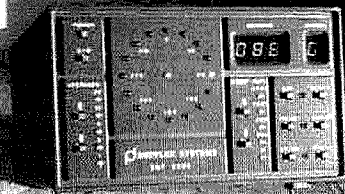
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CW in our heads! At a speed that sounded considerably faster than what we'd been copying from the machine. Who would've thunk it? And why did it happen?

The great "immersion" theory

"It's called *"immersion"* because that's what you do," said a doctor friend of mine. "You literally immerse yourself in your study, project or whatever." He told me that's how he'd had to learn anatomy. "Total immersion," he said. "You read it, think it, talk it, and dream it until it becomes a natural part of your persona."

Training experts tell us that immersing oneself in any subject or pursuit will enhance your ability to learn and to excel in almost anything. But there is one caveat — you must commit to an appropriate amount of time required to master the subject. I'm not sure that I'd agree with the concept of a 24/7 effort with regard to something that's supposed to be a pastime.

In the case of Morse code, you might want to try thinking of it as a second language — in reality that's what it is — a digital language. And try giving it the same time and attention you'd give to learning any new language.

Let's take a closer look at just how you can use this immersion stuff.

Once you get "code on the brain," you'll find yourself *mentally* sounding out words and sentences at every opportunity. During your morning cup of coffee you may find yourself humming some "di-dahs." That corned beef sandwich you got for lunch — did it come with **dah-dah, di-di-dah, di-di-dit, dah, di-dah, di-dah-dit, dah-di-dit**? The city bus blowing by on route **di-di-di-dah-dah, dah-di-di-di-dit**. All of these mental exercises are fodder for your code practice. (And believe me, the code you create this way is a lot easier to hear or feel than it is to read in print!).

You might want to try talking to yourself, too. Yeah I know, this is really sounding goofy now. But just consider how many times a day you talk to yourself, albeit silently — asking questions, making obscene remarks about a co-worker, telling yourself to avoid that cheesecake for dessert, weighing options of doing a job your way instead of theirs. So what's wrong with putting those thoughts in a language other than the one you speak normally — in this case, *Morse*?

Brevity means clarity

I'll admit that all those dits and dahs can be a mouthful. So cutting back on the full-size words and cumbersome phrases would be helpful. We can do this by memorizing and using every accepted CW abbreviation (like GG for "going," HW for "how," and FB for "fine business," "fine," or "great"), prosign (BK, AR, SK, AS, BT, K), and Q signal. All of these can be found in various amateur radio handbooks and selected amateur radio publications.

Continued on page 58

A Tale of the Tape

(You think.)

I was experiencing a pleasurable morning, wandering the rows of fellow amateurs at one of last summer's hamfests. Ancient technology was stacked beside objects of not-so-ancient vintage equipment, all for the browsing of future buyers. Or so was the hope of the vendors plying their wares.

Not having the need for new equipment, nor wanting to rebuild the nostalgia items, I was happy to wander row after row of tables, while looking for "nothing in particular." I sometimes attend the local hamfests to "donate" the entry fee to the sponsoring club, and to "eyeball QSO" should the opportunity arise. I was thinking of times long ago when I operated some of those choice pieces and thought then that it couldn't get much better. Boy,

was I asleep as technology paraded past!

Farther down one row was a small gathering of individuals grouped around a card table. They appeared to be listening to the vendor whom I can only assume was "hawking" his wares to the crowd.

Well, not being one to miss out on what is happening, I scurried along to join the group, to see (and hear) what all the interest was. I'm happy to report that joining that group was one of

and was now available to whoever wished to purchase an item. He didn't seem enthused about parting with any of it, but if the purchaser was adamant, he would sell. His interest was definitely more toward generating interest in the group in operating and building QRP gear!

Continued on page 58

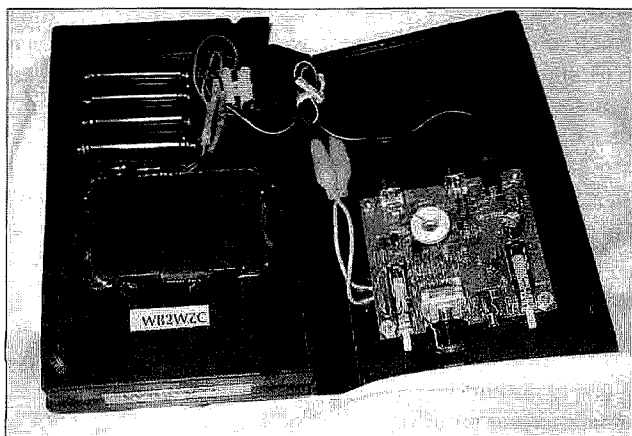


Photo A. Inside workings of the QRP rig installed in a VHS tape enclosure. This rig can be easily stored on the shelf until ready for use. And it looks good too!

the highlights of the day.

Andrew Kabasakalian WB2WZC (PO Box 454, Glenwood, NJ 07418) stood there, chatting with members of the group, and expounding the benefits of QRP and the gear he was willing to part with. Each piece on his table was carefully created by himself

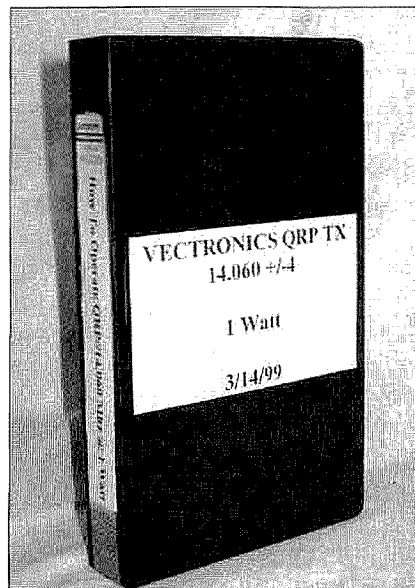


Photo B. VHS tape enclosure.

Daddy's Girl

How a ham license became a ticket ... to grow up.

I knew I had a problem when he first showed up: a tall, red-headed, gangly boy, with a driver's license!

This impressed my daughter, but it scared a few choice words out of me. "What does he want?" I quipped to my wife.

"What do you think he wants?" she replied. "He just wants to visit with Angie."

"She's too young for boys, and probably will be for the next 20 years," I declared. My wife, however, thought that it was kind of cute how they just sat there talking.

"How can they talk so much, they don't even know each other?!" I moaned.

I realized the position I was in from the start. Here I was, the guardian and protector of my household. I was expected to invite this intruder in and treat him respectfully while he figured out how to render me helpless, or rather my daughter, before him. The problem was, the women in my family were all a party to the conspiracy. My wife and I had established rules by which dating would occur, and one by one, exceptions were being made.

It was clear that I was going to lose this battle, so one day when my daughter was not distracted, she asked me how hard it would be to get an amateur

operator's license. Knowing opportunity when I see it, I came home that very night with a license manual for the Technician class license.

Angie is a bright girl, the first of my children. I did not want my kids growing up being afraid to experience life to the fullest, so I taught her important life skills such as learning to ride a bike, and how to swim. The secret to teaching kids any of these skills is to first teach them to love the activity before you teach them how to do it. For example, I took my kids swimming for many days and just had a good time playing in the water before I taught them the elements of swimming. After they became totally at home in the water swimming just seemed to come naturally.

Becoming a ham operator happened the same way. Seeing her dad enjoying and talking about radio contacts peaked her interest enough to one day want to get involved herself.

Not being as dumb as my kids perceived me to be, I saw the opportunity that was embedded within her question. I told her the truth — that it is not hard at all to become licensed. I also seasoned my speech with some

additional sales pitches ... er. words of wisdom ... that I had seen about how scholarships were available to graduating students who were also amateur operators.

My primary motive, however, was that since my daughter, a country girl, was soon to be getting her driver's license, and since this was going to make her infinitely more mobile, I wanted her to be able to call home if the car should break down or the boys started following her everywhere.

I gave her the license manual and I bought one for myself, thinking that I might as well upgrade when it came time to go for the exam. She studied and so did I, and off we went to a test session that is offered every other month by a local radio club. We both passed that night; I made 13 wpm and successfully completed the written exam for the General ticket, and Angie got a no-code Tech license. Of course, on the way home she inquired about getting an HT, and I assured her that a radio would be available for her use — particularly when she was out on a date.

Continued on page 58

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the October issue, we should receive it by July 31. Provide a clear, concise summary of the essential details about your Calendar Event.

JULY 12

OAK CREEK, WI The South Milwaukee ARC Inc. will hold its 36th annual Swapfest on Saturday, July 12th, at the American Legion Post #434 grounds, 9327 S. Shepard Ave., starting at 6:30 a.m. and running until at least 2 p.m. CDT. Free parking, a picnic area, and limited free overnight camping are available. Hot and cold beverages, donuts and sandwiches will also be available starting at 6 a.m. Admission is \$5 per person. Prizes will be awarded during the day and you need not be present to win. A free flyer and map may be had by writing to *The South Milwaukee ARC Inc., P.O. Box 102, South Milwaukee WI 53172-0102*. Talk-in will be on 146.52 (WA9TXE) simplex as well as on many of the local repeaters.

JULY 13

KIMBERTON, PA The Mid-Atlantic ARC will present their annual Valley Forge Hamfest and Computer Fair, Sunday, July 13th, at the Kimberton PA Fire Company Fairgrounds, Route 113, south of the intersection with Route 23. This ARRL sanctioned Hamfest will be held rain or shine. Sellers admitted at 7 a.m. and buyers admitted at 8 a.m. Admission is \$6. Unlicensed spouse and children of licensed amateur radio operator will be admitted free of charge. Lots of great door prizes will be available. Many dealers will be there selling amateur radio and computer gear. Demonstrations will also be featured. For inside tables w/elec., E-mail *Rick Miskinis N3AGS* at reservations@marc-radio.org, or call him at 610-825-9590. Indoor tables are \$10 each for 1 to 4 tables, \$8 each for 5 or more, in addition to admission. Outdoor tailgate space \$6 per space in addition to admission (not available in advance). Food and beverage sales are to be done by authorized vendors only. For more info please E-mail MARC at Hamfest-info@marc-radio.org, or write to MARC, P.O. Box 2154, Southeastern PA 19399-2154. Info is also available on the club Web site at <http://www.marc-radio.org>. Talk-in on 146.835(-) MHz and 443.800(+) MHz PL 131.8. Watch for signs directing you to the site.

JULY 18, 19

OKLAHOMA CITY, OK The Central Oklahoma Radio Amateurs will sponsor its 30th annual "Ham Holiday 2003" at the

Oklahoma State Fair Park, northeast of the I-40 and I-44 intersection, in the Made In Oklahoma building. Doors open 5 p.m. to 8 p.m. Friday, July 18th; 8 a.m. to 5 p.m. Saturday, July 19th. Features: Technical and non technical programs, WAS card check, VE exams, flea market. Pre-registration is \$7, \$10 at the door. Advance flea market tables are \$15, \$20 per table at the door (if available). Electrical hookup \$10. People under 16 years of age are admitted free if accompanied by an adult. Talk-in on 146.82. Additional info and registration forms are available on the CORA Web site at www.qsl.net/coraneu. Vendors, E-mail kc5qcv@cox.net for details. Send pre-registration to CORA Ham Holiday 2003, P.O. 265, Ft. Supply OK 73841-0265.

JULY 19

CARY, NC An ARRL-sanctioned "Mid-Summer Swapfest" will be held by the Cary ARC, July 19th, 8 a.m. to 2+ p.m. at the Herbert Young Community Center, Academy St. and Chapel Hill Rd. Talk-in on 145.39-.6. The event is indoors and air-conditioned. Tickets \$4 in advance and \$5 at the door. VE exams registration at 10 a.m. Testing starts at 11 a.m. Walk-ins OK. E-mail to n4nc@arrl.net, or see the Web site at www.qsl.net/n4nc for more info.

LOVELAND, CO The Northern Colorado ARC will host their Annual Superfest from 8 a.m. to 2 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave., Loveland CO. Features include commercial exhibits, computer and radio goodies, and more. Free parking. Table reservations and general info is available from *Willis Whatley WA5VRL* at 970-407-6599. Talk-in on 145.115(-100 Hz).

JULY 20

SUGAR GROVE, IL The Fox River Radio League of Batavia IL, will hold their Annual Hamfest at Waubensee Community College. Rte. 47 at Waubensee Dr. in Sugar Grove (5 miles NW of Aurora). Talk-in on 147.210(+) PL 103.5/107.2. Doors open Sunday at 8 a.m. Setup is 7 p.m. on Saturday and 6 a.m. to 8 a.m. on Sunday. VE exams start at 10 a.m., bring original license, copy of license and photo ID. Contact *Maurice L. Schietecatte W9CEO*, c/o FRRL, P.O. Box 673, Batavia IL 60510. Phone 815-786-2860, or E-mail to scat42@msn.com. The Web site is at <http://www.frrl.org>.

WASHINGTON, MO The 41st Annual Zero Beaters ARC Hamfest will be held July 20th, 6 a.m. to 2 p.m. at Bernie E. Hillerman Park in Washington MO. Free parking and free admission. Sandwiches, brauts, refreshments and desserts will be available. Features: Commercial vendors, bingo, ham radio and computer flea market, technical sessions and ham radio demonstrations. Additional info and talk-in on 147.24(+) rplr. Watch for green on white hamfest signs. Registration for VE exams starts at 9 a.m. Walk-ins welcome: limit 30. Bring original license and a photocopy. For exam info SASE to ZBARC VE Exam, P.O. Box 1305, Washington MO 63090. For hamfest info, contact Zero Beaters ARC, P.O. Box 1305, Washington MO 63090; or Keith Wilson K0ZHH days at 636-629-7368; fax 636-629-0103.

JULY 26

CINCINNATI, OH West Side - Saturday, July 26, 2002, Flea market 6 a.m. - 1 p.m. Air-conditioned inside vendor area 8 a.m. - 1 p.m. Sponsor: OH KY IN Amateur Radio Society. Location: Diamond Oaks Career Development Campus, 6375 Harrison Avenue, Cincinnati, OH (handicapped accessible). This large facility is located just east of I-275 and I-74. Take I-74 to the Rybolt Road/Harrison Avenue Exit (Exit #11). Go east on Harrison Avenue. Diamond Oaks is located on the right (south side) of Harrison Avenue, less than one mile from the I-74 exit. Special seminars, transmitter hunts, indoor vendors, large outdoor flea market, door prizes, VE exams (8 a.m., walk-ins accepted), refreshments, free parking, handicapped parking available. ARRL-approved! Talk-in: 146.670(-) repeater. Admission: Adv. \$5, gate \$6., age 12 and under free. Indoor vendor tables (6 ft. with free electricity) \$10 ea. Outdoor flea market, \$1 per space. Contact *Lynn Ernst WDBJAW, 10650 Aspen Place, Union KY 41091-7665; 859-657-6161*, E-mail jwd8jaw@arrl.net. Web: www.ohkyin.org.

SWANSEA, MA The Fall River MA Amateur Radio Club will hold its annual Geek-fest, clam-boil, and flea market, Saturday, July 26th, at American Legion Post 303, Ocean Grove Ave., Swansea MA. For more info contact *George KB1CNA* at kb1cna@msn.com; Skip

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CALENDAR EVENTS

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KB1CNB at [kb1cnb@arrl.net]; or 'Roland N1JOY' at [n1joy@arrl.net].

JULY 27

TIMONIUM, MD The Baltimore Radio Amateur Television Society will hold its BRATS Maryland Hamfest and Computer Fest on Sunday, July 27th, at the Timonium Fairgrounds, York Rd. off I-695, I-83. Directions: Take I-695 (the Baltimore Beltway) to Exit 24 (I-83 North). From I-83, take Exit 17 (Padonia Rd. East), then turn right at the 3rd traffic light onto York Rd. Continue south on York Rd. to the Fairgrounds entrance. You can also take the MTA Light Rail to the Timonium Park & Ride stop, or park in the Timonium Park & Ride lot on Deereco Rd. Talk-in on the 147.03(+), 145.13(+), 224.96 and 448.325 MHz rpters. Grounds open for tailgating at 6 a.m. Building opens at 8 a.m. Accessible to the handicapped. Vendors can setup beginning at 2 p.m. on Saturday. Admission is \$6 per adult, children under 12 free. Tailgating spaces are \$10 each, first come, first served. No advance reservations for tailgating spaces. VE exams will be given at 9 a.m. only; check-in is at 8:30. Pre-registration is required. To pre-register call John Creel WB3GXW at 301-572-5124, after 6 p.m. For further info see the Web page at [http://www.bratsatv.org]; E-mail [hamfest@bratsatv.org]; call or fax 410-461-0086; or write BRATS Hamfest, P.O. Box 5915, Baltimore MD 21282-5915.

AUG 2

ALFARATA, PA Juniata Valley ARC Hamfest, 6:30 a.m. General admission, 8:00 a.m. Morning and noon food items available. Admission \$2.00 donation, XYL and children free. Tailgating \$5.00 donation, includes admission. Indoor tables, \$10.00 donation per table. Space is limited. Vendors responsible to collect PA sales tax. Electricity, \$2.00 additional. Please bring your own power cords. Directions: The Decatur Fire Co. is located along US Route 522 North, 8 miles east of Lewistown, PA in the town of Alfarata, PA. Look for signs. Talk-in on 146.910 MHz. For more info, contact JVARC, PO Box 73 Yeagertown PA 17099, or contact Cliff Bell WB3IVX, 717 248 2616.

AUG 10

PEOTONE, IL The Hamfesters Radio Club is proud to announce that they will hold their 69th Annual Hamfest Sunday, August 10th, at the Will County Fairgrounds (I-57 Exit 327 East) in Peotone. The air-conditioned, fully enclosed pavilion ensures you a good spot, rain or shine, hot or not. This hamfest is vendor friendly. Saturday setup from 3 to 11 p.m. (August 9th). Convenient unloading and parking areas. Free overnight parking. A secured building. The

fairground offers plenty of free parking and there are ample food and rest room facilities. Tables are \$15 each, electric \$10. One ticket free per vender. All others \$5 in advance, \$6 at the gate. Your gate pass will be issued at arrival, your ticket will be needed. Gate opens at 6 a.m. Sunday. Main Exhibition Hall opens at 8 a.m. sharp. Send reservations and donations to Robert Nelson WB9WFR, 1720 Vollmer Rd., Flossmoor IL 60422. VE exams will be available. Visit the Web site at [www.hamfesters.org] for more info.

AUG 16

OAKLAND, NJ The Ramapo Mountain ARC will hold its 27th Annual Ham Radio and Computer Flea Market on Saturday, August 16th at the American Legion Hall, 65 Oak St., Oakland NJ. This event is ARRL sanctioned. Vendors setup at 6 a.m., buyers admitted 8 a.m. until Noon. The kitchen opens at 7 a.m. Talk-in on 147.49/146.49 and 146.52 simplex. Donations \$5 with XYL and harmonics admitted free. Inside tables \$12 each. Tailgate spaces \$10 each. For more info please contact Bob Anderson K2BJG, 69 Page Dr., Oakland NJ 07436. Phone 201-337-6945; fax 973-962-6210. Club E-mail [rmarc@qsl.net]. Club Web site [www.qsl.net/rmarc].

SEP 25-28

SEATTLE WA Microwave Update 2003 organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25-28, 2003. Registrations for the joint conference will be accepted beginning April 1st. Cost of the registration will be \$40 prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be \$50. Registration forms can be downloaded at [www.microwaveupdate.org] or send an SASE to John Price N7MWW, 12026 81st Ave. NE, Kirkland WA 98034, and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to Microwave Update 2003. Joint conference sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are \$69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at 425-337-2900. Be sure to mention "Microwave Update" to get this rate. Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to

Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to Jim Christiansen K7ND, via E-mail at [k7nd@att.net]. MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to NU7Z [nu7z@aol.com]. For presentations at the Pacific Northwest VHF Conference sessions, contact N7CFO at [n7cfo@ix.netcom.com]. LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice.

SPECIAL EVENTS, ETC.

AUG 16, 17, 18

NEW JERSEY QSO PARTY The Englewood Amateur Radio Assn., Inc. invites all amateurs the world over to take part in the 44th Annual New Jersey QSO Party. (1) The time of the contest is from 2000 UTC Saturday, August 16th to 0700 UTC Sunday, August 17th and from 1300 UTC Sunday, August 17th to 0200 UTC Monday August 18th. (2) Phone and CW are considered the same contest. A station may be contacted once on each band — phone and CW are considered separate bands. CW contacts may not be made in phone band segments. NJ stations may work other NJ stations. (3) General call is "CO New Jersey" or "CQ NJ". New Jersey stations are requested to identify themselves by signing "De NJ" on CW and "New Jersey calling" on phone. Suggested frequencies are 1810, 3535, 3950, 7035, 7235, 14035, 14285, 21100, 21355, 28100, 287400, 50-50.5, and 144-146. Suggest phone activity on the even hours with 15/10 meters on the odd hours (1500 to 2100 UTC); 160 meters at 0500 UTC. (4) Exchange consists of QSO number and QTH (state/province or country). NJ stations will send county for their QTH. (5) Scoring: Out-of-state stations multiply number of complete contacts with NJ stations times 3 points per QSO times the number of NJ counties worked (maximum of 21). NJ stations multiply number of complete contacts times 3 points per QSO times the multiplier. The multiplier is the sum of the number of states (other than NJ), Canadian provinces, and NJ counties worked. Maximum is 49 + 13 + 21 = 83. (6) Certificates will be awarded to the first place station in each NJ county, state, province, and country. In addition, a second place certificate will be

Continued on page 59

Crickets, Gunshots, and Antenna Placement

My wife hates crickets! Their noise keeps her awake and annoyed. If there's one chirping anywhere in the house at bedtime, I'll have to find and dispatch it before anyone will get any sleep.

What does chasing crickets have to do with direction finding? Well, have you ever tried to locate one in a small area with hard walls such as a bathroom? The sound bounces from all the tile, porcelain, and glass. If the little noisemaker is down in a corner behind the wastebasket, the sound waves can reinforce and cancel such that it appears to come from the shower stall. Sometimes the source appears to change location as I move around the room. And of course as soon as I begin to close in, the little guy detects the heat from my body and stops chirping, only to start again as soon as I leave the room.

The same phenomenon of bouncing signals giving confusing directional indications (which engineers call multipath) causes bearing errors in radio direction finding (RDF) at VHF and UHF frequencies. But before moving to that topic, let's look at another example of acoustic direction finding.

Wheres the gunfight?

A news item in *Wireless System Design* magazine just caught my eye. Proximity Digital Networks of New Orleans and Synchros Technologies of Tulsa are developing a product that is intended to enable law enforcement agencies to determine the precise source of gunshots. When I first saw the item, I was skeptical. After all, it was in the April issue. But a visit to the company's Web site¹ revealed a sales pitch for a system of clamp-on sensors that can be hung from streetlights and other high locations.

The sensors detect impulse sounds such as gunshots and transmit data on their waveform and precise time of arrival via a wireless network. A central computer uses the arrival time and Global Positioning System (GPS) coordinates of the sensors to calculate and map the precise location of the source of the gunshot.² It also analyzes the

waveform to determine — or so claims the manufacturer — the type and caliber of weapon.

The On Alert™ Gunshot Detection System is still in the early stages, but it's scheduled for beta testing by the Tulsa, Oklahoma, County Sheriff's Department in coming months. How well will it work? I certainly have lots of technical questions. Just like the cricket chirp in the bathroom, outdoor gunshot sounds reflect from walls, moving vehicles, trashcans, and just about every other hard object in the environment, including the pavement.

How well can a few overhead sensors determine precise arrival time of the direct acoustic signal? Will the acoustic signature of the weapon be mangled by multipath enough that the precise type can't be determined? What about indoor gunshots

— will a shot inside a convenience store be located and analyzed as easily as one in the alley behind it? How will the sensors react to other percussive sounds such as nearby thunder and backfiring trucks?

Like all good marketers, the folks at Proximity have tried to figure out every possible use of their technology and to adopt the technology to it. Proximity proudly claims to be working on systems to detect and report screams in parking garages, tornadoes, earthquakes, and even the sound of footsteps. If you're involved in testing this system from either the selling or buying standpoint, I'd like to hear from you.

Impulse time-of-arrival location techniques are used for radio multilateration, too. GPS geolocation³ and the Teletrac Vehicle Tracking System⁴ are two examples. For precise locations, the target signal must

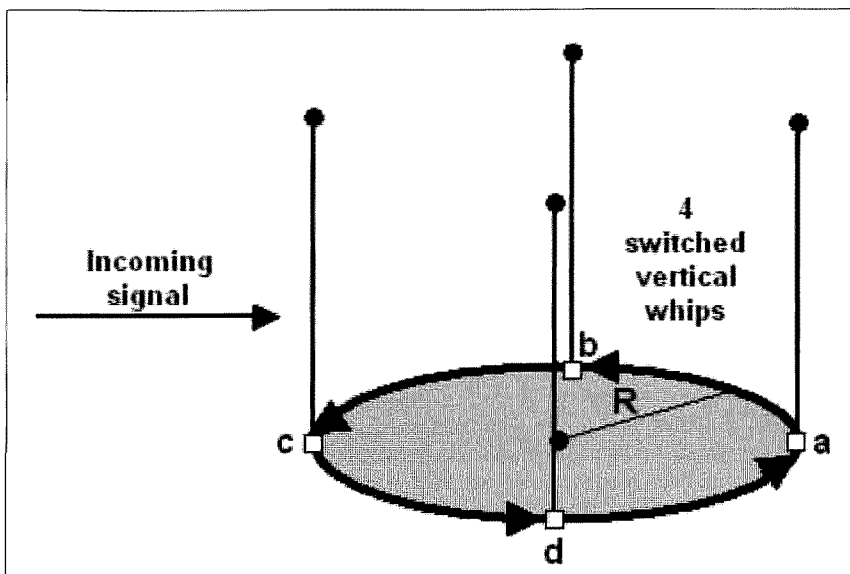


Fig. 1. A Doppler RDF antenna set has vertical elements that are connected to the receiver one at a time, for equal periods, using PIN diodes or other electronic switches. The individual elements should be nondirectional in amplitude and phase.

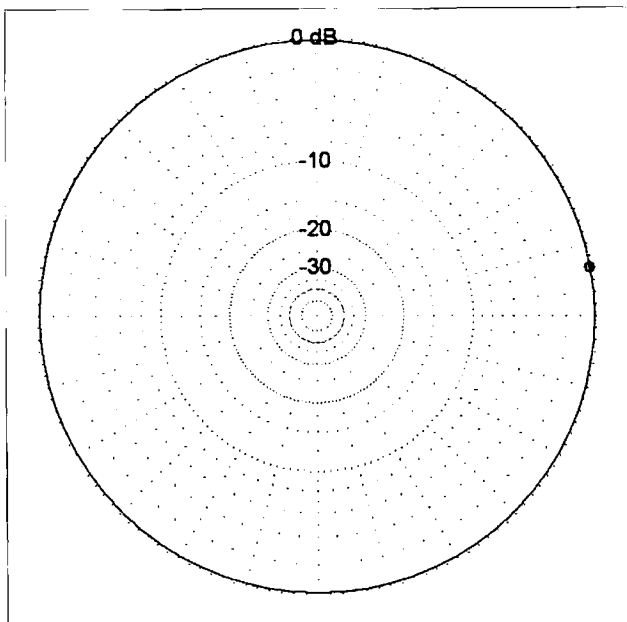


Fig. 2. A quarter-wavelength whip centered on a large conductive surface is almost perfectly omnidirectional in azimuth, as this EZNEC polar plot shows.

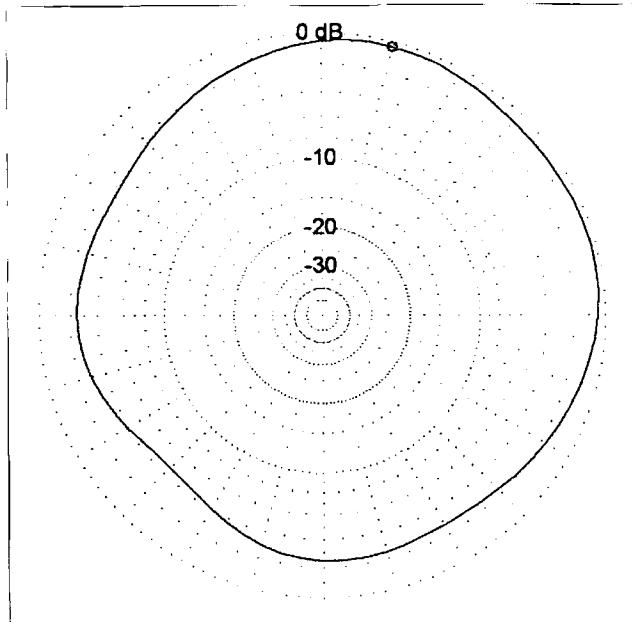


Fig. 3. Mounting a quarter-wavelength whip near a corner of the big ground plane skews the directivity toward the larger plane area. Such directivity is undesirable for elements of a Doppler array.

either be a very short pulse or use coded modulation that can be correlated precisely in time. Hams can't use this method to set up a multiple-site jammer-tracking system because jammers' signals don't have such waveforms.

Nondirectional antenna = better bearings?

For rapid automatic bearing-taking from fixed sites, hams usually choose Doppler RDF sets. "Homing In" is featuring the Doppler technique this year with a special series, in honor of the 200th anniversary of the birth of Austrian physicist Christian Doppler. He first described the principle of apparent frequency shift due to relative motion between source and receiver. In the February issue, I described how the Doppler frequency shift is created in a received signal when a circular array of vertical antennas, whips or verticals, is connected to the receiver one by one in very rapid sequence (see Fig. 1). The phase of the induced Doppler frequency modulation gives the azimuth of the incoming signal.

It's vital to understand that a Doppler antenna set, whether it has three elements, or 16, or any number in between, needs to be a nondirectional array. What, you say? It's giving direction, so isn't it directional? No, it's not in the way that a yagi, quad, rhombic, Sterba curtain, or parabolic dish is directional. A Doppler works on phase, but it's not the same as an array of phased

verticals that an AM broadcast station or a 160-meter DXer might use.

Simply put, a good Doppler array is completely nondirectional in terms of amplitude. No matter what the azimuth of the incoming signal, the amplitude of the RF signal going into the receiver must be the same, and it must remain constant as the Doppler's switch selects the elements of the array in sequence. The signal phase and apparent frequency will (and must) change with the pseudorotation, but amplitude should not.

At this point, some readers are pounding their magazines with their fists, saying, "Why does it matter if the amplitude varies? The receiver has an FM detector, which doesn't respond to AM!" Ah, if only that were true.

FM receivers have limiting IF stages, intended to saturate and effectively clip off amplitude changes in the signal. But they aren't perfect. First, they only limit above a fixed signal threshold. You may have observed this yourself on your broadcast FM radio or TV audio (which is also frequency modulated). If there is a thunderstorm in the area and your AM broadcast radio is beset by static crashes, you won't hear these crashes on very strong FM or TV audio signals due to the receiver's limiting action. But you will hear them on distant FM/TV signals, because those signals aren't up to the limiting threshold.

Second, the amplitude variations aren't just neatly clipped off in a limiter. They still cause slight changes in the phase of the

limited signal presented to the discriminator or ratio detector. This effect is called "AM-to-PM conversion" and it's familiar to radar designers who work with linear-beam tube amplifiers such as klystrons. In saturation (limiting), changes in amplitude at the input cause phase delay changes in the output of up to six degrees per dB of input amplitude change, depending on the gain of the tube. That has an adverse effect on target velocity measurement in a pulse-Doppler aircraft-tracking radar. Similarly, a limiter stage in a receiver will have some AM-to-PM conversion depending on the sharpness of limiting, bandpass versus signal deviation, and so forth.

If a Doppler array is unintentionally directional in amplitude, the AM induced on the signal by pseudorotation will be partially converted to FM/PM in the limiter, causing bearing errors. The more directional the array, the greater the error will be. You may not notice the bearing error when your vehicle is standing still because the error is a fixed amount under these circumstances. You might "calibrate it out" and never realize it. But think what happens when you start moving down a city street, taking bearings on a fixed signal source as you go along.

Like the cricket in the bathroom, the signal you're tracking comes primarily from one direction, but your Doppler also receives momentary reflections from stationary and moving objects between you and the source, especially the close ones. The

more amplitude directivity in your Doppler antenna array, the more this multipath will cause deep signal cancellations that will be turned into significant phase changes in the receiver's IF. The result can be wild fluctuations in the LED display on the front panel.

Symmetry and the sweet spot

If you make your Doppler antenna less directional in amplitude, you will see less fluctuation in the display as you drive through multipath. You probably already know that a quarter-wavelength vertical antenna requires a horizontal conductive ground plane underneath, and that it works best on a vehicle when it's mounted right in the center of the vehicle's metal rooftop. In that position, a two-meter whip gets more than a quarter wavelength of ground plane in all azimuth directions. And just as importantly, the ground plane is nearly equal in all directions.

Just how important is center-of-rooftop mounting to a Doppler? Antenna analysis software can help provide the answer. Using EZNEC,⁵ I simulated a quarter-wavelength vertical monopole (representing one switched element of the Doppler array) on a 4x4-foot SUV roof. Fig. 1 shows the azimuthal pattern of the antenna and radials in free space. It's about as nondirectional as you could hope for, with less than 0.1 dB variation in gain. That would be perfect for Doppler performance.

Next I simulated putting this monopole four inches from a corner of the same roof, an unlikely location but one that makes the point. Fig. 2 shows the results. There is more than 4.3 dB variation in gain around the azimuth circle, enough to degrade Doppler performance in multipath situations due to AM-PM conversion. What's more, antenna elements that are directional in amplitude are also directional in phase.

Unfortunately, EZNEC doesn't compute relative phase versus azimuth or elevation. When I started analyzing Doppler arrays ten years ago with ELNEC for DOS, I asked creator Roy Lewallen W7EL why it doesn't. He told me that until I called him, no one had asked for this feature. Apparently nobody has asked since, because it's not in EZNEC for Windows. However, I know from analysis of vertical AM directional broadcast arrays that 3 dB of gain difference can represent about 45 degrees of relative phase difference.

It's true that most hams are not likely to mount a Doppler array in one corner of the roof, but you might be tempted to put it on the hood or trunk lid. Don't. It will become

even more directional because signals are partially blocked from some angles. Signals from opposite angles will be scattered back into the array with unpredictable gain and phase changes. Don't put it on top of a roof rack either, as that would provide an incomplete and nonsymmetrical ground plane.

Other antennas on your vehicle might have a surprisingly deleterious effect on your Doppler's performance. Fig. 3 shows the directivity of a two-meter quarter-wavelength whip on a perfect ground plane when a 5/8-wavelength communications antenna for the same band (with 50-ohm simulated load) is two feet to the right, as it would be if mounted on the edge of the roof. Doppler signal pickup toward the side with the 5/8-wave whip is reduced by 3.4 dB, with corresponding phase corruption of the incoming wavefront.

Higher gain antennas can affect the wavefront even more. Occasionally I have gone two-meter transmitter hunting with the Doppler antenna centered in the rear half of my 4x8-foot van roof and my RDF quad in front of it. As I rotate the quad to peak up a steady signal, the bearing displayed by the Doppler swings around the LED display, sometimes by up to 90 degrees. The effect is worst for signals coming from the front "through the quad," as you might suspect.

So to recap, the individual elements in switched VHF/UHF Doppler antenna sets must be as nondirectional as possible to achieve the best Doppler performance in multipath environments. Whip antenna sets

need a good symmetrical ground plane with minimum obstructions and an absence of other antennas, especially those resonant in the band of interest.

What about interaction among the whips in the array? Interwhip coupling can cause amplitude directivity effects that are even more severe than those described above. Poor connections to the ground plane can increase this undesirable interwhip coupling. Some Doppler antenna designers don't consider these issues

and then believe it's normal that their displays always go crazy when moving. It doesn't have to be that bad. I'll let you in on the secrets of minimum-directivity antenna arrays in the next installment of this series.

Meanwhile, keep training and planning for the USA ARDF Championships, July 30th to August 3rd in Cincinnati, Ohio. It's going to be a great weekend of challenging on-foot foxhunting on two meters and 80 meters. Learn more about it at the "Homing In" Web site.

Notes

1. [www.proximity.com].
2. This article says the technique was triangulation, but that's a common media mistake. Since the sensors work on time-of-arrival, not directivity, the proper term is multilateration.
3. "Homing In: Navigation and Networking via Packet," *73 Magazine*, October 1994.
4. "Homing In: Three-second T-hunts," *73 Magazine*, July 1991.
5. [www.eznec.com].

73

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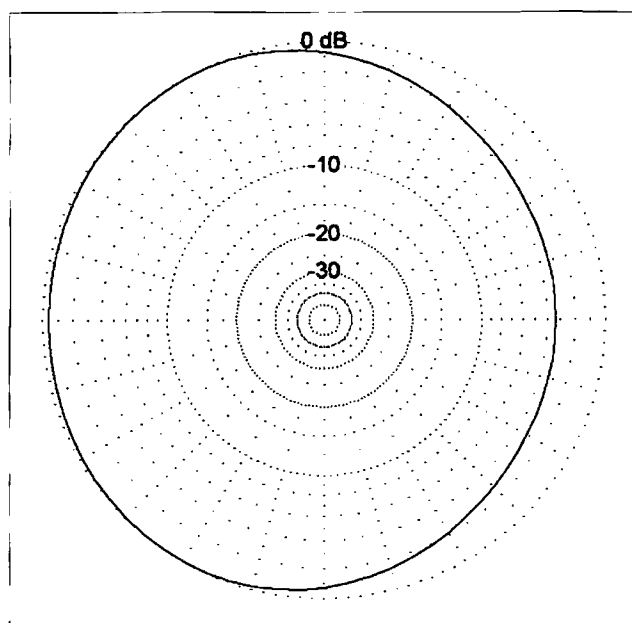


Fig. 4. A communications antenna to the right of the Doppler whip makes that whip's pickup quite directional.

HF Mobile Antenna Selection

After you get your mobile HF rig in your car, what is the next step? The antenna, of course — or is it the antenna mount? Like the chicken and the egg, it's hard to decide which comes first.

I try to approach most issues logically, so I like to start with the basics. Any antenna is a device designed to convert an electrical signal from a transmitter to one that can travel through space. The ideal antenna — called an isotropic antenna — is often used for calculations, but does not actually exist in the real world. (Isn't that the way that it always is?)

Among most real-world antennas there are distinct advantages to making the antenna as large as possible and to locate it as high as possible. A good antenna most commonly works in conjunction with a good earth ground. In addition, a horizontally polarized antenna is generally accepted as being preferable to a vertically polarized one since most man-made radio frequency noise tends to be vertically polarized.

Of course, the need for an effective antenna is largely a result of the amount of power you will be using to transmit. If you run the full legal limit, you can make do with a less effective antenna. On the other hand, if you use lower power, you'll generally benefit from a bigger, better, higher antenna.

In mobile operations, we start with a modest power level to the transmitter, usually no more than 100 watts. A connection to an earth ground is not practical. While in the ham shack we probably have an antenna tuner, in the car trying to adjust one more set of knobs is impractical. Most antennas for mobile operation tend to be vertical polarized and located within ten feet of four or more spark plugs. And finally, the antenna will be physically shortened and be no more than a few feet above the ground. Not exactly the ideal situation to start off with, so careful consideration needs to be given to the type of antenna that you will be using.

There are some very impressive mobile

antennas. Next hamfest you attend, take some time to stroll through the parking lot and look at the variety that exists. If you have only operated VHF and above from your car in the past, you are used to seeing a relatively small and light antenna. A quarter wave antenna for two meters, for example, is just under 20 inches in height. Because of the small size, the antenna can be mounted to the car in a variety of ways. It can be attached to the trunk lip, a magnetic mount, or even capacitively coupled through the windshield or rear window itself. One of the factors that you will need to evaluate in your antenna decision is the load on your vehicle.

Among the largest antennas are single band "bug catchers" and tunable "screw-driver" antennas. One of the best reasons to drive a large SUV or stretch cab pickup is to support these large antennas. I've seen some that look to be at least 20 feet high. Of course, in Wyoming, with its general absence of trees and other obstructions, such an antenna is more practical than in other locales.

Bug catchers tend to include a large coil to tune it to the band on which you intend to operate, and it is the brute size of the antenna that makes it effective. The screw-driver antennas also use a large coil, but it is tunable by use of a small motor such as is used in electric screwdrivers (hence its name). Recently these have begun to shrink, although they do tend to be somewhat bulky. While these types of antennas do work well on trucks, they may be a little difficult to adequately secure on an automobile. Screw-driver antennas have the advantage that they can be used on multiple bands, and you can tweak the antenna for best SWR from within the vehicle. Some even have automatic or memory tuning. Their utility is good, but with the complexity of their construction

they will be higher priced than other antenna types.

The next group of antennas is also multi-band and usually consists of an aluminum mast with several radiators, each tuned for a different band. You can choose to mount a single resonator or as many as five — one vertical at the top of the antenna and four horizontally spaced at 90 degrees from one another. Some of these can be mounted to a trunk lid mount, but you may need to limit yourself to three or fewer resonators due to the weight. Although multiple resonators may present no problem while sitting still, at highway speeds the wind and motion might provide enough torque to damage the antenna and mount.

Other versions of this type of antenna use a 3/8" 24 mount and can be attached to a ball mount or a mount below the bumper. This tends to be somewhat more rugged than the trunk lip mount, but it still pays to be aware of the amount of torque that can exist. I have had a multiband antenna twist loose and get dragged behind the car still attached to the mount — not a pleasant surprise. Some hams attach a guy wire from one or both of the rear windows to the antenna to help it remain in the vertical position.

I have used multiple resonator antennas with a great deal of success, but there are certain things you need to avoid. These include low-hanging tree limbs and low-clearance garages. I currently park on the fourth floor of a parking garage, so a multiple resonator antenna would not be my first choice at this time. If I still parked out in an open lot, my decision might be different.

There is another type of multiband antenna, such as the Outbacker, which consists of a single mast with a jumper that can be changed to determine which band can be

Continued on page 59

Happy Birthday, OSCAR 7!

On June 21, 2002, Pat Gowen G3IOR posted a message to the AMSAT Internet bulletin board reporting on the reception of what appeared to be satellite telemetry.

His message began with, "I have just come across something most remarkable this Friday 21st June evening. Checking out interlopers in our 145.800-146.000 MHz space band with a new vertical now atop my 60' tower and working like magic, at 1728 UTC I came across a beacon at S.7 sending slow 8-10 wpm CW in 145.973.8 MHz. It slowly Dopplered down to 145.970 MHz before going out at 1739 UTC."

Pat was the first to report the rebirth of AMSAT-OSCAR-7. The rechargeable batteries on AO-7 have long since failed, but whenever the satellite is in sunlight, it is active, and working amazingly well. No one could even guess how long AO-7 would work, but it has been extremely reliable for a year since Pat's report, almost like having a new satellite.

Some AO-7 history

AO-7's launch anniversary won't come until later this year. The satellite went to space on November 15, 1974, on board a

Delta 2310 launcher from Vandenberg Air Force Base near Lompac, California. The main payload was an ITOS-G (NOAA-4) weather satellite. A second small satellite launched with AO-7 was the Spanish INTASAT. AO-7 is the second Phase 2 (low-orbit, long-life) satellite from AMSAT (The Radio Amateur Satellite Corporation). AO-7 weighs in at 28.6 kg, and looks like a rather large eight-sided cylinder covered in solar cells. The orbit is circular at 1450 km with an inclination to the equator of 101.7 degrees. This is a tall orbit compared to other LEO (low-earth orbit) hamsats. The potential for quality conversations and DX contacts is excellent via AO-7. In its first life, AO-7 lasted about six and a half years. Then, after 20 years of silence, it came back.

The two-meter and 70-cm antennas are canted turnstiles, while the 10-meter antenna is a dipole extending from the ends of the cylindrical shape. The 2.4 GHz helix is mounted on one end of the space frame. Due to legal issues, the 2.4 GHz transmitter

cannot be activated. It's outside the ham band, as defined in this century.

AO-7 now

Shortly after G3IOR's reception report was positively identified as transmissions from AO-7, Jan King W3GEY, AMSAT-OSCAR-7 Project Manager, stated that AO-7 "has a good set of arrays and the first BCR (Battery Charge Regulator) we ever flew. It's the first spacecraft we ever had that was capable of overcharging the battery. When the battery failed, the cells began to fail short. One cell after another failed and the voltage measured on telemetry began to drop. So, the cells were clearly failing SHORT.

"Now, after all these years, what happens if any one of the cells loses the short and becomes open? Then, the entire power bus becomes unclamped from ground and the spacecraft loads begin to again be powered, but this time only from the arrays. Now you have a daytime-only satellite but, each time

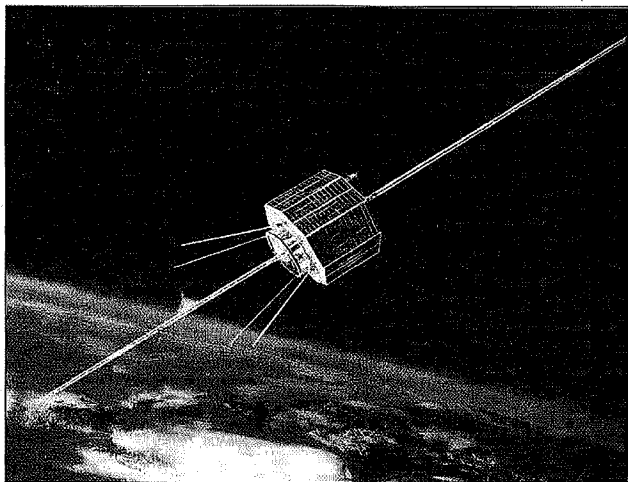


Photo A. Artist's conception of AO-7 in orbit. (W4PUJ)

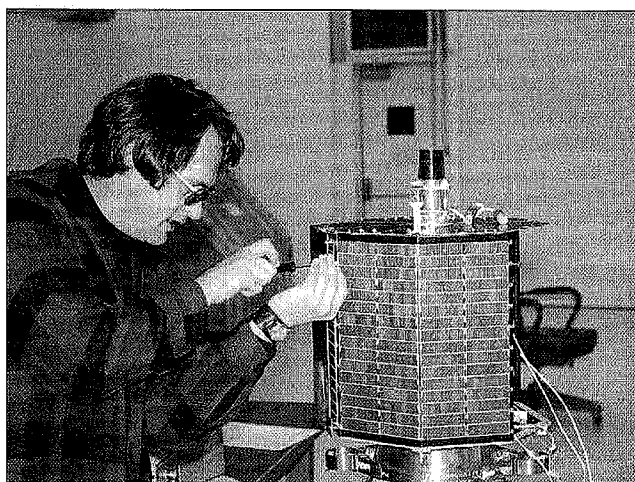


Photo B. Tom Clark W3IWI at work on AO-7. (W4PUJ)

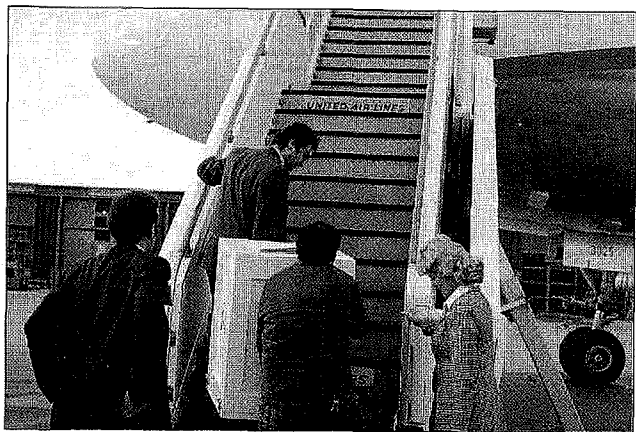


Photo C. Perry Klein W3PK leads the way with AO-7 on its flight to California for the 1974 launch. (W4PUJ)

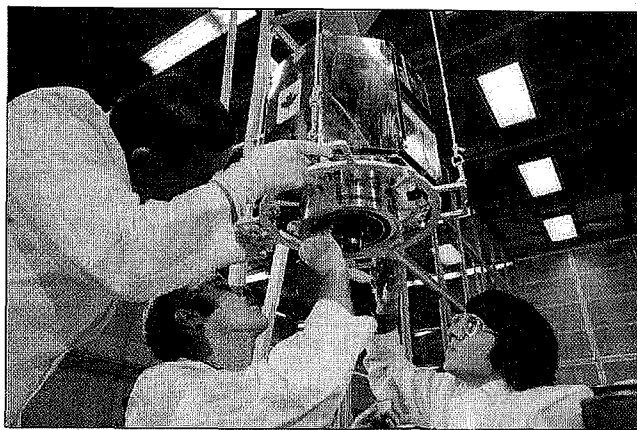


Photo D. Dick Daniels W4PUJ and Jan King W3GEY work on the AO-7 adapter ring just prior to launch. (W4PUJ)

the sun rises at the spacecraft you have a random generator that either turns on Mode A or Mode B or whatever it wants. So occasionally that 70/2m transponder transmitter and beacon must at least work. From what you have told me (and without going back and decoding the old telemetry equations), I can tell you that the following things work in the spacecraft; the arrays, the BCR, the ISR (Instrumentation Switching Regulator), the Mode B transmitter and the beacon injection circuitry, the Morse Code telemetry encoder, and the voltage reference circuitry. The latter I know is working because the last telemetry value is 651. The "6" is just the row number of the telemetry value, but the 51 means that the voltage reference is measuring 0.51 volts. I know that telemetry equation by heart since it was used as the calibration value for the rest of the telemetry system. So the telemetry has a fair chance of being decoded and making some sense!"

A look at the AMSAT Web site [<http://www.amsat.org>] provides all of the data you need to decode AO-7 telemetry. There are three telemetry downlink modes: slow CW, fast CW, and RTTY. There have been no reports of RTTY reception since AO-7 came back to life, but both CW modes have been heard. K3TZ has a simple and free Windows-based program on the AMSAT site that will take text files with raw telemetry (you type in the received CW) and provide a populated display of the results by using the equations associated with each channel. A second method is to use an Excel spreadsheet by W3GEY and WDØE. The received numbers are hand-entered into one column, and the results are calculated and presented in another. Even when the last telemetry value is 651 as in Jan King's explanation, the resultant values shown for some channels can still be wrong due to sensors that

may have failed or drifted in the last 29 years.

The modes of AO-7

Just when you think that AO-7 is locked in a particular mode, it comes up doing something different. AO-7 was the first hamsat to have an elaborate array of transmitters, receivers, and telemetry beacons. The letter designators derived from the logic output signals of the control circuitry, A, B, C, and D, define the satellite's modes of operation. Mode A activated the two-meter receiver in conjunction with the 10-meter transmitter. The 70-cm telemetry beacon can be active during Mode A. Mode B turns on the 70-cm receiver and two-meter transmitter. Mode C is simply a low-power version of Mode B. Mode D activates the 70-cm telemetry beacon. The 2.4 GHz beacon does not have a letter-designated mode. Due to safeguards in the system design, it is doubtful if the satellite could accidentally come up with this microwave beacon active. Several stations have listened for it over the last year, but there have been no reports of anything heard.

Due to the nature of AO-7's orbit, it spends most of its time in sunlight, but whenever it passes into darkness, everything shuts down. When the satellite's solar arrays once again generate enough power to bring AO-7 back to life, the mode of operation should be a random choice of one of the four options. This has not quite been the case. The length of the eclipses seems to have some influence on the "random" selection of A, B, C, or D. It may take a few years to adequately form some theory about the modes of AO-7, but for now it seems that the satellite is somewhat seasonal with Mode A dominant in the spring and Mode B (or C) more likely in the summer and fall.

The best rule is to simply be ready for anything, and make contacts while the sun shines. Some hams have multiple receivers all listening to the beacon frequencies on 10 meters, 2 meters, and 70 cm. Others have programmed the satellite's modes into their radio's memory system, and then switch between them when AO-7 comes over the horizon.

Strange sounds

Not a pass goes by that something strange isn't heard in the downlink passbands of AO-7. The odd carriers seem to be more prevalent in the two-meter transmitter, but curious signals have also been noted in the 10-meter signal. Fortunately none are near the beacon frequencies, and quiet spots can

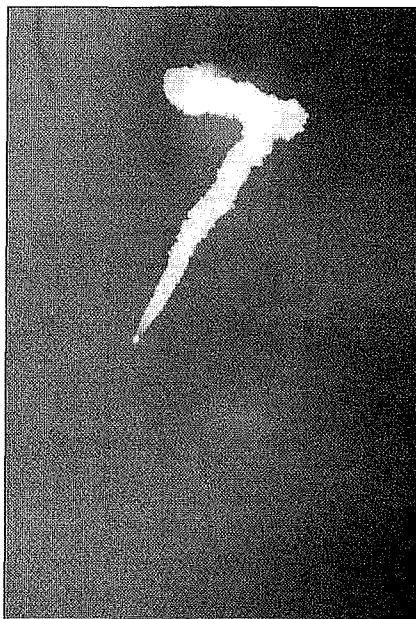


Photo E. The rocket contrail from AO-7's launch in 1974. (AMSAT)

be found near the passband centers where most enthusiasts congregate. The most difficult anomalies are when the whole passband is affected by FMing caused by

high-power uplink signals and also a general raspy sound that sometimes occurs. A good policy for any satellite earthstation is to focus on the receive system and

only run enough uplink power to make a contact.

When AO-7 is operating well, only a few watts of uplink signal (CW or SSB) are

File

About

Orbit #:

0

Date:

06-MAY-2003

Time:

01:50

Channel Parameter 1A - 1D

Total Solar Array Current:

0.000

A

+X Solar Panel Current:

0.410

A

-X Solar Panel Current:

0.490

A

+Y Solar Panel Current:

0.410

A

Channel Parameter 4A - 4D

Baseplate Temperature:

21.800

°C

PA Temperature - 2/10 Rptr:

30.680

°C

+X Facet Temperature:

5.520

°C

+Z Facet Temperature:

9.960

°C

Channel Parameter 2A - 2D

-Y Solar Panel Current:

2.272

A

RF Power Out 70cm/2m:

7.841

W

24-Hr. Clock Time:

15.160

min

Battery Chg/Dischg Current:

0.120

A

Channel Parameter 5A - 5D

PA Temperature - 70/2 Rptr:

35.120

°C

PA Emitter Current 2/10:

58.350

ma

Modulator Temp. - 70/2:

17.360

°C

Instr. Sw. Reg. Input Current:

53.640

ma

Channel Parameter 3A - 3D

Battery Voltage:

14.200

V

Half-Battery Voltage:

9.500

V

Battery Charge Reg. #1:

4.950

V

Battery Temperature:

18.840

°C

Channel Parameter 6A - 6D

RF Power Out - 2m/10m:

0.064

W

RF Power Out - 435MHz:

35.100

mw

RF Power Out - 2304MHz:

0.041

mw

Midrange Telemetry Cal.:

0.510

V

Raw Data

	A	B	C	D
1	0	78	74	78
2	77	1	1	53
3	78	95	33	52
4	50	44	61	58
5	41	5	53	52
6	10	1	1	51

File I/O

Input Data

610 601 601 651

Create .csv output file

Output Data

Auto

Next

Exit

Fig. 1. Results display of the telemetry frame using K3TZ's AO-7 Telemetry Decoder software.

needed to get through. For the 70-cm uplink, best results are obtained with a circularly polarized directional antenna with right- or left-hand switching available. On the 2-meter uplink, the ability to switch polarization isn't required, but power levels up to 50 watts are sometimes needed. The best antenna for 10-meter reception is a small beam with azimuth and elevation control, but very few stations have one. Most use a dipole antenna. Experiment.

When conditions are poor, either because of the satellite or just band conditions, serious VHF and UHF satellite arrays are required. There have been times when the beacon for a particular mode has not been active, but the transponder has been on. There have been very few passes when nothing has been heard, but there have been many passes with no operators to make contacts.

Where is everyone?

During the course of the last year I have made several hundred contacts with just over 100 different stations via AO-7. During too many passes than I would like to count, I have been the only station active in North America. While dozens of stations vie for a few seconds on UoSAT-OSCAR-14, the downlink passband of AO-7 has been silent, with the exception of the strange sounds that never seem to go away. A few of the regulars on UO-14 have discovered the satisfaction of easy roundtables on AO-7. Rather than simply attempt to exchange grid squares, they have time to carry on real conversations, exchange notes about the other satellites, and actually get to know each other. I keep a sorted list of call signs and names of AO-7 enthusiasts, just because I've had so many repeat contacts.

OSCAR 7 frequency guide

Transponder I: Mode A
Type: linear, noninverting
Uplink: 145.80–145.950 MHz
Downlink: 29.400–29.500 MHz
Translation equation: Downlink (MHz) = Uplink (MHz) – 116.450 MHz ± Doppler
Output power: 1.3 watts PEP (start of life)
Beacon: 29.502

Transponder II: Mode B and Mode C (low power)
Type: linear, inverting
Uplink: 432.125–432.175 MHz
Downlink: 145.975–145.925 MHz
Translation equation: Downlink (MHz) = 578.100 – Uplink (MHz) ± Doppler

Morse Code Telemetry Frame Decoder for AMSAT-OSCAR-7									
28-Jun-02 W4RRY/W4RRY									
MC TLM Channel	Function	TLM Count	Analogue Value	Original C300r	Analogue Value	Units	Comments		
1A	1st Antenna Current	0	0	0	0	amps	May have always been broken. Not sure.		
1B	1st Antenna Voltage	78	410	400	400	volts	Some noise in this data.		
1C	1st Antenna Temp	74	400	400	400	°C	Some noise in this data.		
1D	1st Antenna Power	72	410	410	410	Watts	Some noise in this data.		
2A	2nd Antenna Current	77	420	420	420	amps	Some noise in this data.		
2B	2nd Antenna Voltage	73	410	410	410	volts	Some noise in this data.		
2C	2nd Antenna Temp	71	400	400	400	°C	Some noise in this data.		
2D	2nd Antenna Power	70	400	400	400	Watts	Some noise in this data.		
3A	Battery Charge/Discharge	63	1.0	1.0	1.0	Volts	May be measuring PEP output voltage with no battery/lead not with appropriate lead.		
3B	Battery Voltage	25	11.2	11.2	11.2	V			
3C	10 Second Voltage	9	9.2	9.2	9.2	V			
3D	Battery Ch. Regulation Voltage	33	4.35	4.35	4.35	V	Normal for linear with appropriate AC regulator.		
4A	Battery Temperature	52	18.0	18.0	18.0	°C			
4B	Battery Temp	50	21.9	21.9	21.9	°C			
4C	10 Sec. Temp	51	20.7	20.7	20.7	°C			
4D	10 Sec. Temp	51	20.7	20.7	20.7	°C			
5A	10 Sec. Temp	51	20.7	20.7	20.7	°C			
5B	10 Sec. Temp	51	20.7	20.7	20.7	°C			
5C	10 Sec. Temp	51	20.7	20.7	20.7	°C			
5D	10 Sec. Temp	51	20.7	20.7	20.7	°C			
6A	10 Sec. Temp	51	20.7	20.7	20.7	°C			
6B	10 Sec. Temp	51	20.7	20.7	20.7	°C			
6C	10 Sec. Temp	51	20.7	20.7	20.7	°C			
6D	10 Sec. Temp	51	20.7	20.7	20.7	°C			
7A	10 Sec. Temp	51	20.7	20.7	20.7	°C			
7B	10 Sec. Temp	51	20.7	20.7	20.7	°C			
7C	10 Sec. Temp	51	20.7	20.7	20.7	°C			
7D	10 Sec. Temp	51	20.7	20.7	20.7	°C			
8A	10 Sec. Temp	51	20.7	20.7	20.7	°C			
8B	10 Sec. Temp	51	20.7	20.7	20.7	°C			
8C	10 Sec. Temp	51	20.7	20.7	20.7	°C			
8D	10 Sec. Temp	51	20.7	20.7	20.7	°C			

Fig. 2. Telemetry values using the W3GEY/WD0E Excel Telemetry Frame Decoder spreadsheet.

Output power: 8 watts PEP Mode B, 2.5 watts PEP Mode C

Beacon: 145.972

70-cm beacon: 435.1 (rarely heard)

13-cm beacon: 2304.1 (not heard)

Telemetry frame

Here is a complete frame of telemetry from a Mode A pass on May 6, 2003, at 0150 UTC:

HI HI
100 178 174 178
277 201 201 253
378 395 333 352
450 444 461 458
541 505 553 552
610 601 601 651
HI HI

The randomness of AO-7's operation is a challenge to some, but it must be a sticking point for others. It's just not predictable. When the satellite was new, the modes had a schedule. Certain days were for Mode A, some for Mode B, and Wednesday was recharge day or experiment day. AMSAT nets in North America are on Tuesday nights (Wednesday UTC) because that's when the satellites got a rest. Accept the fact that AO-7 is now a random-mode satellite, and make some contacts. Parts of Europe can be worked from Houston, TX via AO-7 on the right passes. Hawaii, Alaska and South America are easy. Some of the first satellite DXCC (ARRL DX Century Club) awards went to stations on the east coast using AO-7. It can happen again. More satellite operators simply need to recognize the possibilities of AO-7 and its tall orbit.

How long will AO-7 last this time? It's been on for over a year now. It may be with us for many more, or it may go silent tomorrow. Don't miss out! In the meantime, Happy Birthday, OSCAR 7!

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Logger32: Powerhouse Freeware

Many of you have been aware of the "old" Logger16 logging program, and most of us have used that faithful standard log system to some extent. I know I did. I used it as somewhat of a benchmark for ease of use and as a good backup for QSO data.

Now the latest version, Logger32, has arrived. It had been promised for a long time, and some of the devotees to the Zakanaka/Logger format were getting extra anxious long before its official release.

But — Wow! And a simple "Wow!" hardly does the result justice. This is really an amazing piece of work. I downloaded it as soon as I heard of it. It is sizable. My dial-up connection took about a half hour to get it into the computer. Actually, that half hour wasn't nearly as frustrating as the time it took to gain a connection to the very busy server that day. Demand resulted in a terrific overload for a few days.

The install went flawlessly. Then I opened it and was truly awed by what I saw. There were all those little windows on my monitor waiting to do things I was simply not ready to ask for.

Discoveries galore

I expected a great log program with a few amenities to help identify previous contacts, along with a window resembling the old Zakanaka communications module. That latter window did not even appear until I found where to click to bring up that part of the display. To tell the truth, it probably took me a good fifteen minutes to even care about whether this software had a way to work PSK31 and RTTY. There was just too much else to explore. By the way, the icon to activate the "Sound Card Data" window to work PSK31 and RTTY is found as the eighth in the row of icons at the top of your monitor and resembles a speaker.

The more I look at this program, the more I realize there is not room enough in a single column to tell all about it. So I will tell you what I see thus far, and you will simply have to go download it and get the rest for yourself.

My thought, going into this review, was to tell what a great log program this is now. It is. There are a lot of log programs available, free as well as commercial. This one is an extremely powerful piece of software and it is FREE.

After working with Logger32 for a few days, it becomes apparent this is an educational feast. And to that, I must add the words, "thoroughly enjoyable." Few single packages come with so many integrated, useful features right out of the box.

I launched into the use of the log portion immediately after recovering from the first exposure to all the other features. The log handles the most extensive array of information about contacts I have ever worked with. I saw so many columns that I made a quick cursory count totaling 47. About the only info not having designated spots are the other operator's Social Security and VISA numbers.

Import the log

The next exercise was to see if I could get log entries that, once in place, would not require extensive editing. I admit to an imperfect log, but I wished not to compound the problem any more by adding to the existing blemishes.

So, I referred to the Help file. This Help File is a work of art. You will believe it when you see it. A few stabs at the Look-up sequence and I found what was needed under the heading of Transferring existing files from Logger16 and other sources. (Title to that effect.)

This is a step-by-step approach for those of us prone to making mistakes and skipping through the process too quickly. I say this because there is even a portion that refers to those who would rush into the import process and get ahead of the game

and need to rectify the errors. And, yes, there are specific instructions for those of us referred to. You can correct those errors and start again. Very nice.

Even though this was fairly straightforward, I printed that five-page portion of the Help File and took my sweet time. It worked out as near perfect as possible in the end. I did not detect any errors after the transfer that did not already exist.

I did a slight extra step I should tell you about. Since I had most of my files already in the old Logger16 program, I updated and corrected that information so the files imported into Logger32 would be from "familiar territory." However, it appears the instructions apply quite well to import data from other sources. There is even a conversion routine that allows for editing such things as BPSK31 or PSK to PSK31 as well as allocating the contents of Comment fields. I ran that and it appeared to have been a real help in the process.

Once you have your log data imported into Logger32 you can begin to experiment with a few of the features. Clicking on Awards brings a submenu that gives you some immediate statistics on states and countries worked including obvious areas you need to work or get confirmation from. Very easy, just click and read.

Simple and intuitive

One quickly obvious seem-to-be problem is the narrow columns that do not allow you to read all the data in a cell. There is a quick remedy. Simply place your cursor at the top of the divider between columns until a two-pointed cursor displays, click and adjust the width to suit. How else do we get all those columns in such a narrow space?

As you move around in your new log, you will discover when you click on an old QSO



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that the info automatically appears in the Previous QSO window along with other QSOs you have logged with the same station. Of course, when you type in a callsign to the Entry window or double-click on a callsign in the PSK31 or RTTY receive pane, similar action occurs.

An idea so clever that took me a moment to realize its existence is alternate tool bars at the top of the screen. That is, if you click on Setup you will get a replacement set of buttons used as you setup the program, then at the right end of this group is a button marked "Main Menu" that gets you back to "normal" view.

There is a surprise when you click the CW button. You will discover what is termed the "CW Machine." This is a sophisticated CW keyer with all the documentation to get it set up and running. The only hardware you will need will be a small circuit similar to a PTT circuit, which is fully documented in the Help file.

As I looked over this program, I naturally had quite a few questions. One concerned the out-of-the-box RTTY capability. That is, did I have to load the MMTTY package into the program folder? Nope — it already comes with it, ready to run. And of course, as usual, the MMTTY engine does a superb job.

The more you look, the more features you find already plugged in and ready to play. One first experiment was to put a known callsign in the receive pane so I could watch the action. I had just barely got the cursor to the callsign when I heard the QRZ disk whirring in the CD drive and that info was displayed, plus the previous QSO was in the appropriate window. Happened so quickly, I had to go back and do another to see what came first. So much action all at once kind of blurs the consciousness.

One area that nagged at me was the little window in the upper right of the screenshot termed "Worked/Confirmed." I kept getting info automatically popping up there and wasn't sure what was causing it. Another trip to the Help and it became clear.

I wasn't seeing a true representation of contacts I had made because most of the

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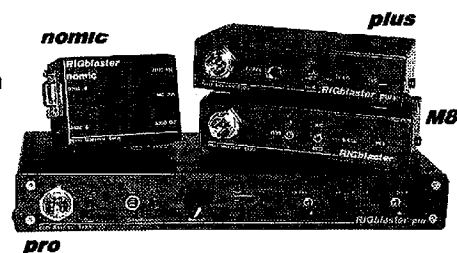
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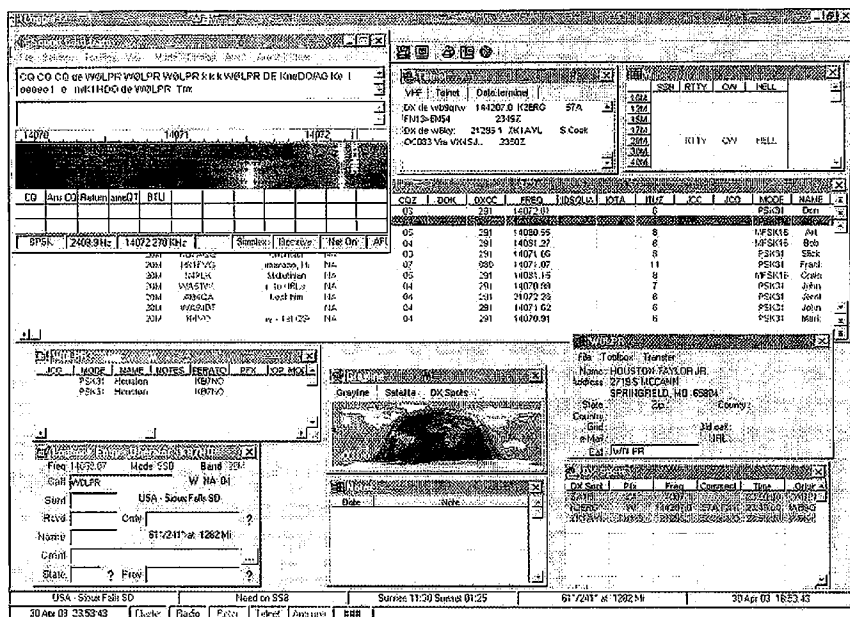


Fig. 1. Logger32 — Here it is. Just about everything you ever wanted, all at once, on a screen near you. I left the Sound Card Data window visible, though at a minimal size and covering some of the icons and menu buttons, just so you could see that this really has a communication mode. The obvious wide (and this is only a small portion) log page is in the center. It has nearly 50 columns to fill all your logging info needs. Many fill automatically. The Grayline display in the middle works well. The Telnet connection is functioning with 3 DX reports indicated in the lower right window. I had clicked on W0LPR in the Receive pane and 2 previous QSOs popped up, plus the CD-ROM disk displayed info for that station. The dark bar in the log indicates a station with whom I have contact and confirmation, so these indicators are throughout the log. The Entry window has been modified to reflect some of my choices and also to show beam headings automatically. I had only inserted a few macros at this time, but found that the macros from Zakanaka transfer and work nicely. The program works with radio control, will control an antenna rotor, select antennas and work with packet cluster. A great piece of work and it is — **FREWARE!**

contacts in my log are PSK31 and other digital modes. I need to revise the "band plan" information in Logger32 and this will all make sense. The two (of my) popular modes displayed are Hell and RTTY, and those are working just fine. I just need to get it to recognize the rest of my laundry list of modes. Not hard to do, but "will take care of that tomorrow."

Edit the Entry window

Speaking of entering callsigns and QSO info, I entered a couple of QSOs manually to experience the process firsthand. I had two that were not in the imported file and felt this would be educational.

I found quickly that though I could struggle through the process, there was some learning to be done. Back to Help. Along the way, I determined that the best way to navigate the Help File is to use the Contents tab. There are a myriad of subjects listed there that I could not find in the normal Search or Index modes. Not to say the writers of the Help File have goofed, but there is just a bit more to do at this writing to make it simple for us to find the good stuff they put in there.

You will find the Entry Window is one area you want to know more about and a visit to the Help File on this subject is worth the read. It can be found under Contents > Logger32 features > Windows > Logbook

Entry Window. It explains how to add fields to the Window to meet your needs, as well as how it works and the best way to use it.

I noticed one thing that bugged me a bit and that was that the little teeny boxes in the Entry Window were not tall enough to display the call letters and other text properly. Simple to fix. What I did was reposition all the little windows on my monitor so I could "grab" the edges and expand the size of the window about 25 or 30 percent. I found that all the windows respond this way and allow you to customize the layout to suit your needs.

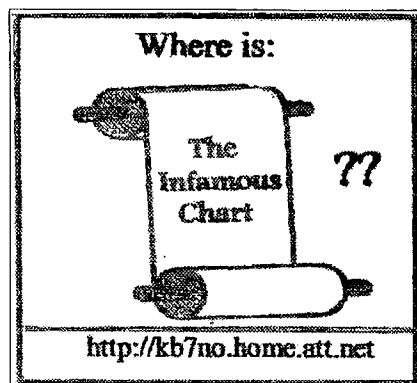
Managing the display

Your eye has without a doubt been drawn to the screenshot for this, and I am sure you wonder how you could work with all the seeming confusion presented by all this much information. Well, take heart, you don't really have to have all these windows up and running all the time. Those you do not want can be deleted and brought back to life with the click of the mouse. I merely wanted to give you one quick bird's-eye view of the possibilities.

As a matter of fact, this is shot on a 19-inch monitor and I resized and moved several windows to get them to display all at once. Even so, I did not do it 100% justice. The communications window labeled "Sound card data" in the upper left really needs to be expanded to about twice the overall dimension shown when you are using it. If you are not using some of the other small windows you can do away with them and there are buttons in the toolbar to bring them back individually and instantly as you need. This kind of screen management will do away with what might be labeled confusion by some not so stout in heart.

One point of interest to me was the activity on the Telnet DX spot and how easily it is set up. The first time I connected to the K4UGA Telnet service, it went so quickly I was connected before I realized it had happened. This was the second foray into that area and I knew what to watch for.

I still use a dial-up Internet connection so that connection had to be made. Then, as nothing was happening, I moved the cursor over the Telnet button at the bottom and the tool-tip told me, "Socket closed," so a right click brought up a small menu and a proper click got the action going. The window at the top middle asked for a callsign and password (my choice seemed to please the system) and it was off to the races. Within a minute or two the three DX stations were showing in the bottom right window. The



default coloring renders them barely readable, but I am sure there is a remedy I will find for that small inconvenience.

You may notice the beam heading numbers in the QSO Entry window. It took me a while to find where to permanently enter the longitude and latitude for this QTH. I again found the answer in the Contents section of the Help File. The secret is to right click on the callsign box and go to the setup option listed in the pop-up menu.

Elsewhere in my reading of this extensive Help File I found reference to the many instances where, should a dilemma present itself, a right click in the appropriate spot answers many questions. This is a very intuitive piece of work once you begin to get inside the author's head. It is very complete and as far as most of us average everyday hams go, about as complete a log system as will ever be wished for.

I did not find instructions to print QSL cards or labels but there is reference to making lists not only for cards but for using eQSL. I am sure it is simply my own rush to get this in the mail that has caused me to miss a part I am sure is either in place or coming soon.

All in all, the gigantic size of this undertaking, as well as the near perfection of the finished product, symbolizes tons of patience on the part of the author, Bob Furzer K4CY. A great contribution to the ham community.

Other stuff

There has been a lot of activity in the DXSoft camp. I see messages that TrueTTY and AALog have a lot of updates including a waterfall in TrueTTY and some other amenities. I have to get copies and see what is happening. There is usually more happening than I can shake a stick at with out poking myself in the eye.

Also, I hear rumors of great things emerging from MixW in the 2.08 version. They are keeping it pretty well under wraps at this time, but I hear of a new filter claimed to be very effective and some work being done on a TOR mode. We shall see what pops up.

Back to smoke signals?

We just got back from a trip into a portion of northern California with our recently acquired travel trailer. I have not mounted radio stuff as yet, but it would not have helped much. We did carry a cell phone, which was out of range of anything most of the time we were camped. It is quieter that way, but we were attempting to contact our son whose only phone is a cell and it became about hilarious to me how futile high-buck

technology becomes when it competes with small mountains.

So, just possibly, there is still room for primitive means of communication such as smoke signals or beating on hollow logs.

That's about enough for this month. Keep those digital fires lit. See you on the air. 73 Jack.

Yes, I Built Sixteen Log Periodic Antennas!

continued from page 28

16. "High-Gain Log Periodic Antenna for 10, 15 and 20." G.E. Smith W4AEO, *Ham Radio*, Sept. 1973.

17. "Vertical Monopole Log Periodic Antennas for 40 and 80 Meters," G.E. Smith W4AEO, *Ham Radio*, Sept. 1973.

18. "Mono-Band Log Periodic Antennas," G.E. Smith W4AEO, 73 *Magazine*, Part 1, Aug. 1973. Part 2 — Sept. 1973.

19. "The Log Periodic Dipole Array," Peter Rhodes K4EWG, *QST*, Nov. 1973.

20. *Beam Antenna Handbook*, Bill Orr W6SAI, p. 104.

21. "Fixed Log Periodic Beam for 15 and 20 Meters," G.E. Smith W4AEO, *Ham Radio*, May 1974.

22. "Designing Log Periodic Beam Antennas by the Graphic Method," G.E. Smith W4AEO, *Communications News*, June 1974, pp. 82-87.

23. "Feed Systems for Log Periodic Antennas," G.E. Smith W4AEO, *Ham Radio*, October 1974.

Batteries to the Max!

continued from page 34

Battery test equipment

Battery analyzers have become an important tool to test, exercise, and restore batteries. The Cadex 7400, for example, accommodates NiCd, NiMH, Li-ion/polymer, and lead-acid batteries, and is programmable to a wide range of voltage and current settings. A quick-test program measures battery state-of-health in three minutes, and a boost program

reactivates dead batteries. There is even a program to measure the battery self-discharge.

Battery analyzers are capable of solving a multitude of battery problems. Regular exercise doubles the service life of NiCd and reduces replacement costs. Unserviceable batteries are weeded out before they cause problems. Most important, battery analyzers improve battery reliability, an issue that is of significance in critical mission applications.

This article contains excerpts from the second edition book I wrote entitled *Batteries in a Portable World — A Handbook on Rechargeable Batteries for Non-Engineers*. In the book, I evaluate the batteries in everyday use and explain their strengths and weaknesses in laymen's terms. The 300-page book is available from Cadex Electronics, Inc., through [book@cadex.com], tel. 604-231-7777, or most bookstores. For additional information on battery technology, visit [www.buchmann.ca].

About the author

Isidor Buchmann is the founder and CEO of Cadex Electronics, Inc., in Richmond (Vancouver), British Columbia, Canada. Mr. Buchmann has a background in radio communications and for two decades has studied the behavior of rechargeable batteries in practical, everyday applications. The author of many articles and books on battery maintenance technology, Mr. Buchmann is a well-known speaker who has delivered technical papers and presentations at seminars and conferences around the world.

About the company

Cadex Electronics, Inc., designs and manufactures advanced battery chargers, analyzers, and battery management software. The award-winning products are built with one goal in mind — to make batteries run longer. They are used in wireless communications, emergency services, mobile computing, avionics, biomedical, broadcasting, and defense. Cadex is ISO 9001-certified and has products that are sold in over 100 countries.

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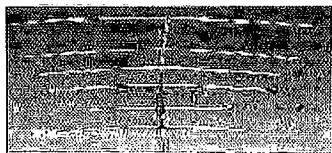
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Morse-by-Mouth

continued from page 40

Armed with these CW helpers, we can cut our talk time and get our message across faster, with more clarity. And learning them can expand our code knowledge and ability.

The Code is alive and well

With the diminishing use of code requirements in the FCC licensing structure, and the cessation by the U.S. military, you'd think that the death knell had been sounded for CW. Far from it. Morse remains a much used mode among thousands of amateurs around the globe. Just tune down to the CW portion of any active band during an ARRL CW Sweepstakes or WPQ CW contest. Or, ask any DXer — they'll tell you that when it comes to cutting through the band clutter and QRN to make that tough contact, Morse is the only way to fly. **73**

A Tale of the Tape

continued from page 41

Obviously, he noted my keen interest in his products. It must have been the careful inspection I was giving each piece, or perhaps it's because I talk to myself (but often get the wrong answers to questions I ask).

"Which one interests you," he asked politely?

"The VHS tape, what's that one for?" I asked, pointing to a black case.

He handed me the VHS tape closure and said, "Go ahead, open it."

Inside was a very nicely assembled Vectronics VEC-1220 transmitter with a battery pack for operating and a solar panel as an additional source of power. Now that's what I call "ham ingenuity." See **Photo A**.

The binder of the VHS case was labeled, "How to Operate QRP//14.060 @ 1 Watt." The matching receiver VHS assembly had become the property of some other lucky amateur at the hamfest. I was told that it included a QRP tuner and antenna, all contained within the VHS tape case.

Sometimes we overlook the obvious

when searching for ways to "house" our latest creations. This is the answer to those amateurs who have little space at their QTH for a large assemblage of gear but want to remain active in the hobby. Multiple single band rigs could be built and stored on book shelves inconspicuously. They are there, ready and waiting to be used on the next QRP outing away from the QTH. Even if "away from the QTH" is out on the balcony of a condo!

There are other QRP kits available from various sources. MFJ, Ramsey, Hamtronics, and Vectronics are a few manufacturers of commercial kits, and that's not mentioning those available from NJQRP, NORCAL, etc. Or how about a home-brew rig? Something from past issues of 73, or one of the QRP designs proliferating the Internet these days? Kits are a great way to build, and I have completed many. But there is also the joy of creating from "scratch," and there are many designs that are suitable for this type of endeavor.

Now that CD players are dominating the market, the need for VHS cases is diminishing. And the "Dollar Store" often has them for sale in bundles of four, five, and even six for a dollar. An attractive finish to a small project can't become much more inexpensive than that, unless of course you can get them for free. See **Photo B**.

Ingenuity and creativity are the hallmarks of QRP building. So get out there and put together a rig. You'll be amazed at how much you really can accomplish! **73**

Daddy's Girl

continued from page 42

From that day forward my daughter had orders to call home on the HT if she was going to be late or if she needed help. Since I had radios in my vehicles and she had use of an HT and knew how to use the local repeater to make a phone patch, I figured that I had all of the communication options covered fairly well. A short while later she got her driver's license and was released out into the world.

It worked fairly well for a while, but one day she came home asking another question. My worst fears came to fruition when she asked if she could go on a backpacking trip with her boyfriend on a portion of the Appalachian Trail. After she answered many more of my questions, I found some comfort in the fact that his parents were also going along.

When you are backpacking, weight is a primary concern. Items are weighed in ounces to keep your pack as light as possible, but my request was honored that an HT with extra batteries be taken along. We also established a schedule for making contact through a repeater on a mountain located between our two positions.

On their first night out I listened and called on the agreed-upon frequency, and was about to give up, when I heard a scratchy FM signal come back to my call. She said that they were camped down in a valley and that reception was poor, but she was okay, having a good time, and that everything was fine. As I sat there and we both signed off, it struck me that daddy's girl was not going to be Daddy's Girl much longer. I am grateful to this day that she was gracious enough to cut the ties slowly, to keep her dad from going into "loss of children shock."

To bring you up to date on this story, Daddy's Girl is pregnant, but this grandpa-to-be doesn't care. She's been married now for four years to a wonderful, outdoor-loving son-in-law. No, it isn't the tall, red-headed, gangly boy! For some reason he just no longer came around anymore. Well, what did you expect? The boy didn't like radios much anyway. 73

CALENDAR EVENTS

continued from page 44

awarded when four or more logs are received. A total of two plaques have been donated by the ARRL Section Managers for NNJ and SNJ to the highest scoring single operator station residing in each of their sections. (7) Logs must also show the UTC date and time, QSO exchange, band, and emission, and be received no later than September 13th, 2003. The first contact for each claimed multiplier must be indicated and numbered and a check

list of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to *Englewood Amateur Radio Assn., Inc., P.O. Box 528, Englewood NJ 07631-0528*. A #10 size SASE should be included for results. (8) Stations planning active participation in New Jersey are requested to advise EARA by August 1st of your intentions so that they may plan for full coverage from all counties. Portable and mobile operation is encouraged. 73

ON THE GO

continued from page 48

used. The advantage is that only one antenna is needed. The disadvantage is that you cannot change bands except while stopped.

In my most recent mobile HF installation I agonized over which type of antenna to use, and eventually decided on a series of single band HF antennas. I tend not to band switch a lot while operating, but I still wanted the ability to easily change bands. Although these antennas tend to run up to nearly 8 feet, the coil is at the bottom and the top section is a flexible whip. I run a piece of monofilament fishing line to the tip of the whip, and when pulling into the parking garage I pull the line in so that it clears the low overhang. Besides, it makes sense to put the least expensive component (the whip) closer to those overhanging supports.

While there are a number of manufacturers and distributors of single band antennas, I decided to go with the Iron Horse line from ATOC Technologies. They make resonators for all the bands from 80 meters to 6 meters and you can buy a bundle that includes 10-15-20-40- and 75-meter antennas. The antennas use the popular 3/8" 24 mount, but with the optional quick disconnect mounting kit you can push and twist an antenna on and off in just seconds. Plus, once the SWR has been set, quick disconnect will minimize changes when moving the antenna from one vehicle to another.

Recently ATOC announced a new line of mini HF antennas. Like their full-size products, these utilize the 3/8" 24 mount and can be fitted with the quick disconnect mounting kit. However, these antennas are roughly half the size of the standard HF sticks. The shorter antennas have a fiberglass stick of less than 36 inches (depending upon band) and can handle up to 250 watts PEP — more than adequate for mobile operations. Also, you can get the same five band bundle as with the full-time sticks.

Your needs may determine a different

selection of antenna type than what I decided, but hopefully the information presented here will help in the process. Next month, I'll focus on installing and using the antennas.

Contact ATOC at ATOC Technologies, Inc., 23 South High Street, P.O. Box 36, Covington, OH 45318; 937-473-2840; [www.atotechnologies.com]. 73

NEVER SAY DIE

continued from page 17

Waste?

Newsweek had a report on our troops overseas. I can understand the need for troops in Iraq, not for fighting, but to help get the country working again. And 5,000 more in Afghanistan, which also is in desperate need of building.

But, how come we have 71,400 in Germany? And 39,700 in Japan? I'd like to see the 38,000 in South Korea brought back home. All told, we have 255,000 troops in foreign countries around the world, not counting Iraq and Afghanistan. At how much a day? No wonder our military budget is more than all the other countries in the world's combined.

Then there's our foreign aid bill, with Israel leading at \$2.8 billion, then Egypt at \$2 billion, and a dozen other countries getting over \$100 million a year. Like Pakistan with \$921 million.

I proposed long ago that we stop being Daddy Big Bucks and swap off aid for land that we could develop into free enterprise zones. For Pakistan, even at \$1,000 an acre, we'd be getting a million acres a year to develop. In that way our foreign aid would pay for itself in no time, benefiting both us and the aided country. All these countries desperately need business development and trade. At a thousand an acre, we'd own all of Israel in a few years.

Imagine!

How about an America with no bars or liquor stores? No candy stores? No McDonald's, Burger King, Pizza Hut, Taco Bell as we know them? No General Foods, General Mills, Starbucks, Dunkin' Doughnuts, Sara Lee, Dairy Queen, Baskin Robbins, Breyers, Ben & Jerry's, Kellogg's, cigarette machines, candy machines, Famous Amos, Pepperidge Farms, Keebler, Oreos, National Biscuit, Boston Market, Bob Evans, Howard Johnson, TCBY, Domino's Pizza, Budweiser, Miller, Coors, crack houses, and so on?

An America with a tenth of today's

Continued on page 61

Multiple Returning Coronal Holes

Solar activity will range from quiet to active in July, with occasional geomagnetic disturbances expected.

Multiple returning coronal holes will cause the most trouble this month, with minor storm conditions forecast for the periods from the 1st to the 5th, the 13th to the 20th, and the 24th to 28th. Solar flares and CMEs should be less of a problem as sunspot numbers decline, but look out for large older spots that are capable of producing M-class and X-class flares.

Large "mature" sunspots can be unusually persistent in the declining phase of the solar cycle, and they also tend to become magnetically more complex over time as they drift near the solar equator. Two particularly large spots of this variety suddenly became active at the end of April, producing some very large eruptions that created widespread blackout conditions and spectacular auroral displays.

Sporadic-E propagation should be intense and widespread this month, helping to liven up the seasonally impoverished lower bands, especially 10 meters. Sporadic-E skip is caused by large, intensely ionized regions in the E-layer of the ionosphere that are reflective to HF signals in the 10-15 meter range. The exact mechanism behind sporadic-E is not known, but it has been associated with such disparate phenomena as geomagnetic activity and thunderstorms. The general consensus is that solar activity is not the only cause, or even the primary one. Studies show that peak summertime periods of sporadic-E propagation in the mid-latitudes are from 10 a.m. to noon and 6 p.m. to 8 p.m.

Most of the time sporadic-E will rapidly dissipate after sundown, but some very intensely ionized regions have been known to persist well after dark. Due to prevailing winds in the lower ionosphere, e-clouds tend to drift at more than 100 mph, so the length of any opening is directly related to the size of the cloud you are working. Sporadic-E propagation appears more or less at

July 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
		1 F-G	2 F-G	3 F-G	4 F-P	5 F-G
6 F	7 G	8 F-G	9 F-P	10 F	11 F-G	12 F
13 P	14 F-P	15 F	16 F-G	17 F-P	18 F-P	19 P
20 F-P	21 F	22 F	23 F-G	24 F	25 F	26 F-G
27 F-G	28 G	29 G	30 F-G	31 F-P		

EASTERN UNITED STATES TO:												
GMT	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15-20	(15-40)	20 (40)	20 (40)	(20)	(20)	(15-20)	15 (20)	15 (20)	15 (20)	10-20	(12) 20
South America	15-20	(15)	(15) 20	(20-30)	x	(20)	(15-20)	(15)	(15)	(10-15)	10 (20)	(10) 20
Western Europe	20 (40)	20-40	(20-40)	(20-40)	20	(20)	(15-17)	(15)	x	(15-20)	(15) 20	(17) 20
Southern Africa	(40)	(40)	20	20	x	x	x	(12) 15	(15)	(20)	(20)	x
Eastern Europe	20 (30)	20 (40)	(20-30)	x	x	x	x	x	x	(15-20)	(12) 20	(17) 20
Middle East	20 (40)	20 (40)	(20-30)	x	x	(20)	x	x	(15)	(15-20)	15-20	(15) 20
India/Pakistan	(15-20)	(20)	x	x	(20)	x	x	x	x	x	x	(15)
Far East/Japan	x	x	x	x	x	(20)	(20)	x	x	x	x	(15)
Southeast Asia	(15-20)	x	(20)	x	x	(20)	x	x	x	x	x	(15-20)
Australia	15	(15)	15 (20)	20 (30)	(20-40)	(20)	(17) 20	(20)	x	x	x	(15)
Alaska	(15)	(20)	(20)	(20)	(20)	(20)	(20)	x	x	x	(15)	(15)
Hawaii	15 (20)	(15) 20	20 (30)	20 (30)	20 (30)	(20-30)	(20)	x	x	x	(15)	(10-15)
Western USA	(12) 20	(12) 40	(20) 40	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20
CENTRAL UNITED STATES TO:												
Central America	15-20	(15) 20	20 (40)	20 (40)	(20)	20 (40)	20	(15) 20	15 (20)	(10-20)	10 (20)	(10) 20
South America	10-20	(12) 20	(15-40)	(20-40)	x	(20)	(20)	(15)	x	(10-12)	(10-15)	10 (20)
Western Europe	(17) 20	20 (30)	20 (40)	(40)	x	(20)	(20)	x	x	x	x	(15) 20
Southern Africa	x	x	(30-40)	(20)	x	x	x	(15)	(15)	(20)	(20)	x
Eastern Europe	20	20 (40)	(20-30)	(20)	x	(20)	(20)	x	x	(15)	(15-20)	(20)
Middle East	(17) 20	20 (40)	(20-30)	x	x	x	(20)	x	x	x	(15)	(15-20)
India/Pakistan	(15-20)	(15-20)	(20)	(20)	(20)	(20)	(20)	x	x	x	x	x
Far East/Japan	(15)	(15)	(15)	x	(20)	(20-40)	20 (30)	(17) 20	(20)	x	x	x
Southeast Asia	(15)	(15)	(20)	(20)	(20)	(20)	(20)	(20)	x	x	x	x
Australia	(15)	15	(15-20)	20 (30)	20 (40)	(20-40)	20 (40)	20	x	x	(15)	x
Alaska	(15-17)	15 (17)	(15) 17	(20)	(20-30)	(20-40)	20 (30)	(20)	x	x	(15)	x
Hawaii	(10-20)	15 (20)	(15) 20	20	20 (40)	(20-40)	20 (30)	(20)	x	x	(15)	x
WESTERN UNITED STATES TO:												
Central America	(12) 20	(15) 20	20 (30)	20 (40)	(20-30)	(20-40)	(20-30)	20	(15-20)	(10-17)	(10-17)	(10-20)
South America	12 (20)	(12) 20	(15) 20	(17) 20	(20-40)	(20)	(20-30)	(15-20)	x	x	(10-15)	(10-15)
Western Europe	(17) 20	20	20	(20)	x	x	x	(20)	(15-17)	(15)	x	(15-17)
Southern Africa	x	x	x	(20)	(20)	x	x	(20)	(17-20)	(15-17)	x	x
Eastern Europe	x	x	20 (30)	(20)	x	x	x	x	x	x	x	x
Middle East	(20)	(20)	(17) 20	(20)	x	x	x	x	x	(15)	x	x
India/Pakistan	x	x	(15)	x	x	x	(20)	(20)	(20)	(15-17)	x	x
Far East/Japan	(15)	x	(20)	(17) 20	20	20 (40)	(20-40)	20 (30)	(17) 20	(15-20)	x	15
Southeast Asia	x	x	(15)	x	(20)	(20-30)	(20-30)	20 (30)	(17) 20	(17-20)	x	x
Australia	(10-15)	(10) 15	(12) 15	(15-20)	20	20 (40)	20-40	(17) 20	(17) 20	x	x	(12-15)
Alaska	(12-15)	(12-15)	(15-20)	(17-20)	20 (30)	(20-30)	(20-40)	20 (30)	(20)	(17)	x	(15)
Hawaii	(10-15)	(10) 15	(12) 15	(15-20)	20-40	(20) 40	20 (30)	(20)	x	x	(15)	(15)
Western USA	(12) 20	(12) 40	(20) 40	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

random and there is no way to predict exactly when or where it will occur, but back-scatter radar has been used successfully to map and model it.

A good home-grown technique to spot a sporadic-E opening is to orient your antenna northeast-southwest and listen for back-scatter on 10 meters. Try monitoring one of the beacons in your area between 28.2 and 28.3 MHz, and if there is back-scatter from one of those, there could be good reason to start calling CQ, even if the band appears closed. Sporadic-E is an interesting phenomenon that can spice up an otherwise dull summer day. 73, Jim.

Band-by-Band Forecast

10-12 meters. Good openings will generally only be available on north-south paths, but Europe and Africa may still be workable, especially if multi-hop sporadic-E is present. The strongest and most reliable paths will be to Central and South America from shortly after noon through early evening. Daytime short-skip will range from 1,000 to approximately 2,300 miles.

15-17 meters. Sporadic-E openings will be worth watching for this month, especially multi-hop paths to the east before noon. Fair to good "normal" propagation will also be available to most areas of the world from sunrise through sunset, but South America will be your surest bet. On good days, Europe and parts of Africa ought to be workable in the morning and Australia or Southeast Asia should provide steady fare up to midnight. Short-skip will average from 1,000 to 2,200 miles.

20 meters. Expect good worldwide daytime opportunities and fair to good evening conditions. Some nighttime openings will be available, but these will be quite limited. Look for peak periods an hour or two after sunrise and again in the late afternoon. Europe and Africa should provide good hunting grounds from the eastern US, while on the west coast you'll find that the South Pacific and Australia will offer better openings. Short-skip can fluctuate between 500 and 2,300 miles.

30-40 meters. Good opportunities should be available from sunset to sunrise on good days, especially to the Southern Hemisphere. As always, atmospheric static due to nocturnal thunderstorms will be the main problem, but on the quieter nights you should find solid pipelines from the Caribbean to northern South America and across the Pacific to New Zealand, Australia, and Indonesia. Short-skip at night will range from 500 to 2,500 miles but will be limited to less than 1,000 miles during the day.

80-160 meters. Fair to good worldwide DXing should be available from sunset through sunrise on the quieter days. If 40 meters is doing well, some good opportunities should also be available on 80, but 160 will usually be buried in atmospheric static. Daytime skip will be very short — under 250 miles — but nighttime short-skip can range from 1,000 to 2,000 miles. 73

NEVER SAY DIE

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hospitals, doctors, dentists, HMOs, clinics, assisted living, nursing homes, and nurses. No major pharmaceutical companies. Millions of lawyers forced to turn to honest work!

Once we get the word around about health, this is the possible future for Americans.

Considering the \$4.5 billion a year bribing of our media by the above interests through their advertising, we aren't going to get much help from our newspapers, magazines, radio, TV, billboards, etc. So where can we turn for help? To the people who will benefit the most from Americans being healthy: employers who are tired of robbing their bottom lines for health insurance payments. Oh, and to "health nuts" like me.

How much could our town, state, and federal governments save if their employees stopped making themselves sick? And the Post Office? Would it only be hundreds of billions, or trillions?

Imagine our farming conglomerates converting to super-organic farming, with no more need for chemical fertilizers or pesticides?

Dr. Weston Price, early in the last century, visited primitive societies not yet contacted by the rest of the world. He documented people who were living well over a hundred in perfect health. See page 36 of my *Wisdom Guide* for a review of his 1939 book, *Nutrition and Physical Degeneration*. Before the arrival of our "modern diet" cancer, Alzheimer's, heart disease, stroke, and most other causes of death today were almost unknown. As was the need for doctors or police.

Geothermal Systems

Looking for a new business? How about installing geothermal heating/cooling systems?

What you do is dig a trench a couple hundred feet long and about six feet deep, where you bury a six-inch pipe which leads to a home. Install a blower to suck the outside air through the pipe into the home.

The idea is that since the temperature of the earth at that depth the air passing through will be cooled in the summer, saving a bundle on air conditioning ... and it will be warmed in the winter, saving on heating costs. Plus no pollution. This will pay for itself in a fairly short time.

Bypass Danger

Time reported that almost half the people getting bypass surgery suffer brain damage which results in cognitive decline. Permanent IQ and memory decline. D'uh?

Before you report in for bypass surgery maybe you should take a couple hours and read Dick Quinn's *Left For Dead*. It's reviewed on page 7 of my *Secret Guide to Wisdom*. Dick had a heart attack and bypass surgery. What the doctors neglected to explain to him was that he was causing his problems with his diet and that unless he changed that he'd be back for another bypass ... if he survived a second heart attack.

Then he accidentally discovered that cayenne pepper could roto-root his arteries. I add a heaping teaspoon of it to a small glass of V-8 juice. Yes, it burns twice.

Better yet, change your diet!

Music, Music

I've come across many articles on the benefits of listening to good music. It helps prenatal babies' brain development and thus their IQ. It helps children study and learn better. *60 Minutes* had a segment on the amazing success with slum children in Venezuela when they formed school bands.

So I was excited when I came across Sharlene Habermeyer's *Good Music Brighter Children*, 344p, 1999, Prima Publishing, \$16, ISBN 0-7615-2150-X.

She makes a good case for listening to good music, and even better, that learning to play an instrument helps a child with math and science. Considering that by 2010 it's projected that America will have a shortfall estimated at a million scientists and engineers, we'd better start making some changes if high-tech isn't going to move elsewhere.

When I was in the third and fourth grades in New Jersey I had classes which taught me how to read music ... in art appreciation, with guides as to why the composition of famous paintings was so good ... and in poetry, complete with encouraging us to write poems. When I got interested in photography that art background was very valuable ... and more so when I started out as a TV cameraman at WPIX Channel 11

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NEVER SAY DIE

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in New York. My work was so good that I was soon doing the one hour Gloria Swanson variety show just on my one camera. My early music classes made it easy for me to become a St. Paul's Church chorister and then, in high school, sing with the Erasmus Hall Choral Club, doing radio performances, and with Robert Shaw's Brooklyn Philharmonic Choir. Shaw went on to become a legend, with his chorus singing with the Atlanta Symphony Orchestra.

At PS-99 in Brooklyn there were weekly music appreciation sessions for the entire student body where we learned little ditties to help us recognize classical music selections. Schubert's 8th had us singing, "This is the symphony that Schubert wrote, but never finished."

I'll bet the schools don't do any of that anymore.

Many of the famous composers and scientists claim that their mothers played music or sang to them prenatally. Even fathers are getting into the act with "pregnaphones," which allow them to talk, sing, read poetry, and so on to their unborn child. Researchers have found profound dramatic development difference to children exposed to what they're calling a "prenatal university."

Children so exposed are starting to talk and sing back simple melodies sung to them at five months, singing short sentences at nine months, and teaching themselves to read at two years of age. Infants as young as two months were able to imitate the pitch and intensity of songs their parents sung to them.

Take classical music to the hospital and play it while the baby is being born. This helps calm the baby during what otherwise could be a very traumatic event. By the way, there should never be any talking during the birth process. Silence, except for classical music. Probably Mozart.

So what?

When the International Association for the Evaluation of Educational Achievement tested the science proficiency of 14-year-olds throughout the world fifteen years ago, America came in 14th out of the 17 countries tested. Considering that we spend twenty-nine times more on math and science programs than any other country in the world, this is a most revealing testimony to how crummy our schools are. Since then, I understand, we've now sunk to the bottom on international tests.

How ignorant are our students? Just listen to a few of Jay Leno's street interviews with them.

The three top countries were Hungary,

Japan and the Netherlands. So what's different? For one, extensive music training is part of their curriculum from kindergarten through high school. They study music, music appreciation, and learn to play an instrument.

Hundreds of studies have shown the role music plays in brain development. So why have we seen music programs eliminated in so many schools? Well, they cost money, and the teachers, administrators, and school boards who make the decisions on programs are unaware of the research.

So what've we got? Well the California State University says that 75% of their freshmen needed remedial classes in math and, like, that English thing. Of course, in California more than 30,000 classrooms are being taught by teachers without teaching certificates ... a "no experience necessary" job.

Our 19th century school system was designed to get kids off the farms and provide workers for factories. Now the factory jobs are disappearing to Mexico and Bangladesh and we have entered the information age. We don't need to just improve our schools, we need to totally reinvent them. Oh, and start the music playing, early and often.

If your K-12 education did not, like mine, include music appreciation, then you'll need to invest \$3 in my 100-CD Classical Music Library book.

WMD

Golly, those weapons of mass destruction that we went into Iraq to find sure seem to be elusive. Were they just an excuse for taking over the country with another goal actually the main reason, or the result of lousy intelligence?

None of the sites where the Pentagon was insisting they would be found have turned up anything.

Rumsfeld

The Defense Secretary has been in the news quite a bit of late, so I was surprised when his name popped up in a book Sherry was reading, *The Fat Fal-lacy* by Will Clower, a 2003-published paperback.

It had to do with the FDA's approval of aspartame (a.k.a. NutraSweet or the blue stuff) for human consumption, a saga worthy of being made into a documentary. Hello, *60 Minutes*?

It started thirty years ago when J.D. Searle first applied for approval. An independent board of scientists concluded it was not safe.

When, in 1974, it was approved in dry form for restricted use, the scientists objected. When they checked Searle's data

they found that of seven baby monkeys given aspartame in their milk one died and five suffered from grand mal seizures. This data, of course, had not been given the FDA when they applied for approval.

The FDA turned to the U.S. Attorney's office to investigate Searle's concealing the harmful evidence. The case was dropped after the office let the statute of limitations run out without acting on the complaint.

In 1979, under growing pressure from a cascade of tumor reports, the FDA investigated again ... and rescinded their okay.

In 1981, the day after Ronald Reagan took office Searle, without supplying any new data, again applied for aspartame approval. With Searle's CEO, Donald Rumsfeld, on Reagan's transition team, how could they lose?

The new FDA head, Arthur Hays, had an advisory panel look into it. They said absolutely no. So Hays overruled the panel and approved NutraSweet for dry products.

The National Soft Drink Association lobbied against the approval because when aspartame gets above 86°F it breaks down into free methanol (wood alcohol) a common poison. This is a problem because it breaks down into formic acid, which is used to strip off epoxy, and formaldehyde (embalming fluid). So this is what you get when you use the blue stuff in hot chocolate, coffee, tea, or make diet Jell-O.

Despite this, Hayes approved aspartame for use in carbonated beverages ... and then, within four months, left the FDA to become a very highly paid consultant for Searle's PR firm.

Now, twenty years later, and an article in *Fortune*, where I see that Rumsfeld was on the board of Zurich-based engineering giant ABB, when a \$200 million contract to build two nuclear reactors for North Korea was signed. Now that we sure wish that had never happened, since weapons-grade nuclear material could be extracted from the reactors, Rumsfeld has declined to comment.

So what's Rummy done for us lately? Well, as Defense Secretary he almost single-handedly planned the Iraq invasion ... ignoring the advice of the military brass. The quick coup made Rummy the hero of the war. For a little while. But then the almost total lack of preparation for dealing with Iraq without Hussein has created an awful mess. Soldiers aren't trained to be police or deal with getting food, water and electricity working again. Or with tens of thousands of looters. Or with an angry population stirred up by religious leaders.

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$15 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively - once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands. Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UL, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

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Colloid Reprint. April 97 article on a silver colloid maker, history, and how to use the stuff. \$5 (#98)

Colloid Clips. Three 9V battery clips, 2 alligator clips & instructions. \$5 (#99)

AC-powered Colloid Kit: 12V power supply, silver wires, reprint, including priority mail shipment. \$37 (#82)

Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry; Schools in 2020: another \$ trillion industry. Anthrax, a simple cure. Dowsing: why and how it works. \$3 (#86)

My 1992 We The People Declare War! On Our Lousy Government book—360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need: **NASA Mooned America:** René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was \$7. I found a few in the warehouse. \$3. while they last. Great book! (#83)

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Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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NEVER SAY DIE

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Talking Plants

The American Society of Dowsers quarterly digest had a fascinating reprint of a chapter from a book by Keith Varnum. I'll have to get it and read the whole book.

This had to do with him going to work for Michio Kushi, where he was responsible for a garden about half the size of a football field, where the food was grown for Kushi's East-West Institute in Los Angeles. This was a huge garden to water, fertilize, and weed.

When he complained about the enormity of the task Michio explained, "You know, you don't really have to weed the fields. You can talk to the spirit of the weeds and ask them to grow in balance and harmony with the vegetables."

That's crazy, he thought ... but since everything else Michio said he'd tried had worked, what the heck. So he began talking aloud to the weeds, asking them to grow in harmony with the vegetables. Then he also talked to the vegetables, urging them to grow tall and in harmony with their weed neighbors. After a few weeks he began to see a change. The weeds grew, but not enough to harm the vegetables.

Next month: Then the voices started. 72

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QRX . . .

Death, Taxes, and the Phone Company

Well, some are calling it a new way for the telephone company to try to communicate with the dearly departed. A resident of the town of Auburn, Massachusetts, died in December of 1997 at age 60. He was buried at the nearby Hillside Cemetery. So it was quite a surprise for the Cemetery Superintendent to receive a bill addressed to the deceased at his graveside.

Even more shocking was the amount of the bill from Sprint. It was for 12 cents. That's right: A big 12 cents, and it included a 10 cent charge for a call placed on February 16, 2003 — a call that the phone company claims was made five years after the man had departed from his life.

Well, the bill has been handed over to the Auburn Town Clerk. She says that she will hold on to it for a while.

Continued on page 6

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article (IBM (ok) or Mac (preferred) formats), carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

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Wise Up & Beat the Odds

NEVER SAY DIE

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Share the Fun

It's pretty clear by now that the ARRL isn't going to lift a finger to promote the hobby in the media, no matter how bad things get. Do I fault them for this situation? Of course not ... if the League members had the slightest interest in keeping the hobby going they'd be raising hell with HQ about it. And they're not. Not a whimper. It's the old boiled frog syndrome.

One thing that would help would be a booklet that could be gotten out to kids explaining what fun they could be having on our ham bands. Somewhere around 95% of the kids today are totally unaware of our hobby. It's degenerated into a hobby almost totally enjoyed by old retired white men.

Most of us few survivors got involved in the hobby as teenagers. Heck, that's when we had the time it took. That was before we got married and worked a 9 to 5 job we hated to make enough money to raise a family. Hamming takes time and money, neither of which are in plentiful supply to most family men.

It was tough enough getting recruits a few decades ago when those few of us surviving were kids, what with the teenage interest in girls and sports. Now we're up against the Internet, Napster, chat rooms, computer games, and 24/7 100-plus-channel TV.

Several times I've asked you to tell me what fun you're having. I'd love to be able to reprint a series of enthusiastic

letters in a booklet for teenagers so they'll see what they've been missing.

Today's kids aren't interested in the fun I had 60 years ago building my ham gear. Or my pioneering repeaters, RTTY, SSB, and going on DXpeditions long before they were born. To get kids' attention, we need to explain what fun they could be having today. So, what have you been doing that's fun?

Zzzzzzz?

New Tricks

JoAnne Schmuss KD4ODQ just passed her Extra Class exam. Not bad for a 71-year-old. Now, what's all that beefing about the no-code license test? Gimme a break!

Ignorance vs. Stupidity

Learning to read is one thing. Actually doing it, another. Ignorance is a lack of learning. Stupidity is not bothering to learn.

So, where am I going with this?

Toward learning. And, that's not easy. You see, there's a world of difference between learning to read and reading to learn. The main obstacle, once one has an interest in reading to learn, is the high percentage of baloney that's being passed off as nonfiction. The reality is that we're being lied to about so many things.

A couple years ago The Disinformation Company published a 400-page 9x12 book, *You're Being Lied To*, a wonderful collection of exposés. See [www.disinfo.com]. It's one of the best \$20 book

investments you'll ever make. Last year they followed with *Everything You Know Is Wrong*, 350 pages and \$25.

In my research I've learned that we have been and are still being lied to at every turn.

One of the biggest lies, one that is affecting your and your family's life more than all the others combined, has to do with health. We are being lied to by the medical/pharmaceutical complex, the government, our doctors, the food industry, and on down the line.

Which may explain why I've been such an itch about this in a ham magazine.

The key to good health is pathetically simple. It even makes good common sense. If you want to be healthy, stop putting poisons into your body. What part of not poisoning yourself don't you understand?

I go into the gory details of all the poisons in my *Secret Guide to Health*, 160 pages, \$15.

Some, like nicotine, caffeine, alcohol, and refined sugar, are self-evident. The most insidious by far is cooked food. As soon as you cook food it kills the enzymes and vitamins your body needs, but even worse, your immune system treats it as toxic, rushing out the white cells to fight it, lowering your immune system's ability to deal with invading germs, viruses, parasites, cancer, and so on.

The more you're able to change your lifestyle to a raw food diet, the sooner your body will be able to repair the years of damage you've done.

And More Lies

Like the 9/11 attack, Flight 800, Roswell, contactees, the Florida voting machines, Iraq's WMDs, cold fusion being a bust, our school system, cancer and AIDS not being easily cured, milk being safe to drink, global warming, vaccinations safe, the drug war, the Moon landings, Pearl Harbor, Amelia Earhart, one bomb at Oklahoma City, sonograms not damaging babies, cell phones not burning out brain cells, the sun causing skin cancer, crop circles being made by people, the shuttle and space station being of any value, hot fusion having any potential, and so on. Cheesh, what a bunch of lies we're fed ... and accept.

Another Cancer Cover-Up

Acres USA published a great interview with Dan Haley, the author of *Politics In Healing*. In his book, Dan gives us the details of ten cases where the AMA has suppressed cures for serious diseases.

Take Dr. William Koch. Seventy years ago he discovered that cancer results when a body's oxidation system is impaired. He developed a way to trigger the body to reverse the process with one injection of glyoxylyde. The book explains how he made this substance.

The AMA, anxious to stop this simple cancer cure, tried to buy Dr. Koch out. When he refused, the FDA, under pressure from the AMA, took Koch to court in 1942, and again in 1946, trying to stop

him. But with the testimony of over 200 of his patients who had been cured of cancer with his one-shot treatment, Koch won. So the AMA next went after him through the Federal Trade Commission.

The FTC made life miserable for Koch, so when finally he won their trial against him, he could see that the AMA would never give up trying to stop him and he moved to Brazil.

By an odd "coincidence" the assistant attorney general who prosecuted Koch died of cancer a few months after the trial. Then the head of the FDA office, the FTC prosecutor, and the FTC administrative judge all died of cancer.

The AMA has fought every cancer cure vigorously because cancer is the medical industry's biggest money maker. And never mind the 550,000 Americans dying of cancer every year. The current "accepted" treatments result in a 7% survival rate, making cancer a hugely expensive virtual death sentence.

The casualties are equivalent to three fully loaded 747s crashing and killing everybody on board every day — the main difference being that the plane crashes would make the evening news and the papers.

Today we're seeing the same AMA response to the work of Drs. Comby, Day, Kaali, and others. Nothing has changed.

Turn Down The Heat!

By Gorey, global warming sure hasn't hit New Hampshire yet. Brrr. I can remember when June used to be the hottest month of the year. This summer (?), June 20th came and I still hadn't taken the air conditioner out of the closet. There were a few days when it actually got over 70° and I was able to take my shirt off on my daily walks through our fields to get some sun.

This year Washington, DC, had the coldest February in 25 years. New York got its fourth deepest snowfall since 1869. Baltimore got more

snow in February than any other month in recorded history. *Science* reported that the West Antarctic ice sheet has been growing thicker, not melting. The Antarctic has been getting colder for the last 30 years, not warmer.

Sure, the thousands of new volcanoes under the Pacific have heated the ocean, calving some of the Antarctic ice shelves.

The endless spring and early summer rain has resulted in the most fantastic wildflower extravaganza I've ever seen in our fields. How I wish you could have walked through them with me ... it's like an endless symphony in beauty. Over twenty kinds of wildflowers, many by the millions. No, make that billions. Daisies three feet high. But then, almost everything grew to three feet high by June ... stuff that's normally only six inches.

Weird weather.

Jim McCanney says this is a manifestation of the influence Planet X is having on our sun. Unlike Mark Hazelwood and Nancy Lieder, he's expecting it to arrive in about ten years. Hmm, there's that darned 2012 date again. The sun is erupting with huge solar flares, so something strange is going on. And how about those new government observatories at the South Pole? What are they for? And why the government secrecy? Everything about this is now classified. Highly classified, according to McCanney. I've got his book on *Planet X* available for \$18 (#95) Radio Bookshop.

And you've been at a loss for things to talk about?

What Gives?

With the May 15th Planet X deadline passed, and Lieder's June 1st extended deadline too, have we had another Y2K false alarm? The sky hasn't fallen. The Earth hasn't stopped turning. Whew!

So, what, pray tell, is going on? Something is. Like astronomers tell us that Pluto has started moving further away from the Sun and is

already 2° warmer. The centuries-old dark spot on Neptune has vanished and a new one is forming. Triton is warming. Jupiter's spot is shrinking and Io is warming. The ice caps on Mars are melting. Earth's gravity field has been changing. The Sun is shooting out record eruptions.

And what's that coming around the Sun that several amateur astronomers have gotten pictures of? See [www.crosswynd.com].

Then there's the Vatican observatory in Arizona that is now being guarded by U.S. troops. How come they need an observatory? Why in Arizona? And what's all the secrecy?

Hmm, yeah, sure, but how are the Red Sox doing?

The Wealthy

They're doing fabulously, thank you. Better than ever! Meanwhile American families have seen their income remain flat through the '80s and '90s, except for the top 1%, where it zoomed from an inflation-adjusted \$256,000 to \$644,000.

Hmm, how come? That's easy ... the wealthy use their money to buy influence and use that influence to make more money. Like the recent tax cuts, for instance.

So, what's next? If history is going to repeat itself, a burst of warfare will waste our energy and money just as it did Holland in the 1700s and Britain in the last century. Think Great Britain, where the sun never set and is now almost irrelevant?

Watch out, you Iranian devils, here we come! Doesn't Syria need fixing, too? Heck, with high-tech wars only costing a few hundred billion, let's have at it. Say, is Libya still a problem? Oh, and let's clean up that nasty Sudan mess.

Coincidence?

Maybe you've read about the 19 world-class microbiologists who were murdered between October 2001 and February 2002. This has been mentioned several times on the Art Bell show, and a

reader sent me a newspaper article about it.

Something's going on. Hello, CIA, is that you?

Allen's Alley

We old-timers remember Woody Allen's *Don't Drink The Water*. I saw the play, read the book, saw the movie. The advice is just as good today. Please don't let your family drink tap water. I was reminded by the latest issue of the *Nutritional Health Journal*, which had an article on water. It says that 50,000 Americans die from health problems caused by fluoridated water. A Harvard University study reported that 15% of all rectal and 9% of bladder problems are caused by chlorinated water. And the EPA warns that chlorine causes high blood pressure and may be linked to Alzheimer's. The *Journal* recommends switching to distilled water.

Hey, where have I heard that one before?

It goes on to point out that your cold cereal breakfast was made from genetically modified crops grown on mineral-depleted land, soaked in pesticides proven to be carcinogenic, and fortified with chemicals and preservatives to prevent spoiling in the box. Amalgam fillings are slowly releasing mercury into your body. A Swiss study found that blood levels of mercury were three times higher in Alzheimer's patients. Then there are those prescription drugs, which they report depress your immune system, rob you of essential nutrients and minerals, and lead to such side effects as liver and kidney failure. It also warns against any canned, bottled, or prepackaged foods.

Gee, all the same things I've been trying to get you to believe as you eat your way to an early grave.

Fluoride Law

Yep, it's now the law in California that every city with more than 10,000 water hookups must fluoridate their

Continued on page 9

QRX

continued from page 1

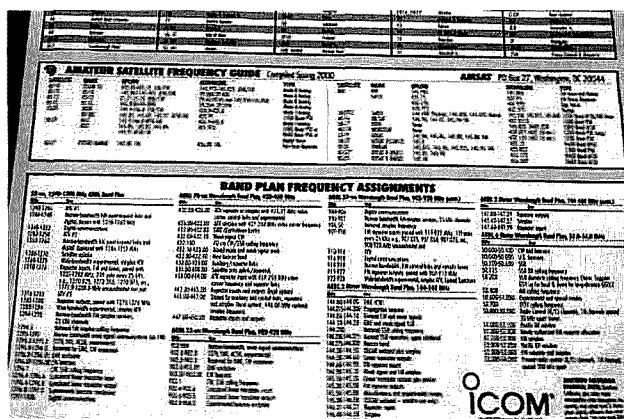
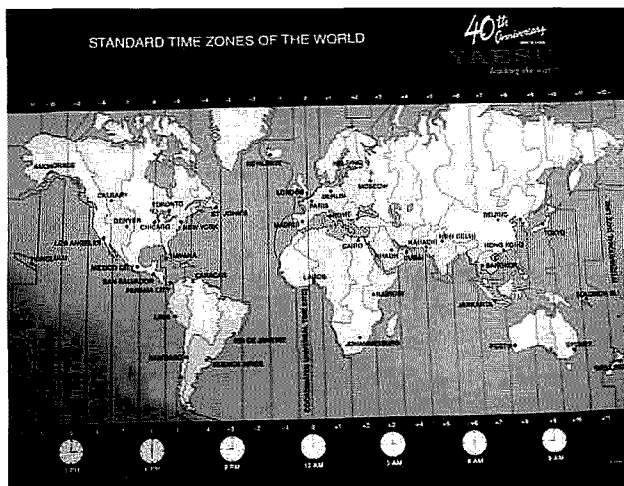


Photo A. Three images show just some of the free materials now available to ham class instructors.

Meanwhile, a call to Sprint Telephone's automated service by a local newspaper in March showed that charges on the unpaid account had inflated. The dearly departed now owes Sprint \$3.95. But for the moment the bill remains unpaid. This is because technically speaking, the account is now — quite dead.

The Cemetery Superintendent probably had the best line of all. He told a local newsman that his clients don't usually get mail. Now he wonders if it's time to start putting mailboxes on graveside monuments.

And we must report that it is not true that when this apparent error was pointed out to Sprint, their spokesperson was so quiet you could hear a pin drop.

Free Training Materials for Ham Class Instructors

Amateur radio equipment and accessory manufacturers dazzle hamfest attendees with give-a-way materials in their ham booths. These include world callsign prefix wall maps (Yaesu), glossy stiff-paper color frequency privileges charts (ICOM America), logbooks (Kenwood and Yaesu), VHF/UHF + HF band charts (Kenwood), color frequency privileges chart (Alinco), blank graduation certificates (W5YI), ballcaps and pens (seasonal), *QST Magazine* samplers (ARRL), and huge color radio spectrum charts from DC to daylight (ICOM America).

The ham goes home from the hamfest and puts the map up on the wall and the frequency operating charts under the glass on the radio table.

But imagine the impact of these materials in a classroom for brand-new ham students. The big fold-out electromagnetic spectrum chart is a natural for teaching the relationship between frequency, wavelength, and FCC band allocations. The color privileges chart makes for easy teaching of ham band privileges for various licenses. The logbook includes many pages of reference, including foreign callsign prefixes, and the VHF/UHF color band plan charts make it easy for the instructor to explain satellite and weak signal portions of the 440 MHz band.

"At the ham shows, we are not prepared to give a ham radio instructor a class quantity of these materials — we usually give one or two out to each attendee," explains one ham radio manufacturer, indicating the cost of one of his handouts is over 75 cents each.

"I wish we had time to read all of the requests that come in on E-mail and by letter from ham instructors teaching a class and wanting a quantity of our free literature — we just don't have the manpower to work up this kind of individual instructor program," echo most ham manufacturers when I discuss the need for ham instructors to have quantities of their materials.

For the last four years leading amateur radio manufacturers plus the American Radio Relay League have offered a stockpile of these training materials available to any amateur radio instructor wishing to bring in these training charts and paperwork for their students at the beginning of class. The demand has continuously grown for this service, so effective immediately, a major-size collection of free instructor training materials is available through the W5YI examiners in Dallas, Texas. W5YI: [www.haminstructor.com].

Also available to amateur radio Elmers and instructors is the 30-page Technician class *Instructor's Guide* written by Gordon West WB6NOA. This guide parallels the new July 1, 2003, Technician class question pool, and not only gives the instructor a detailed teaching plan, but also includes pre-study that prospective students will fill out before class begins. The pre-study may also be incorporated within the course as homework. Permission is granted to reproduce the pre-study pages.

There's even more! ICOM America has issued \$20 gift certificates that instructors may give out at the completion of their course for new hams to purchase new ICOM amateur radio equipment (valued at over \$200). There is also available colorful graduation certificates that the instructor may issue to every student passing the test.

Also available to instructors who register with the W5YI instructor program is the 65-page *QST* special edition magazine from the American Radio Relay League. This special edition of *QST* is specifically printed for new and upgrading amateur operators. Subjects like "How Do Repeaters Work?", "Ham Radio and Public Service," "Getting the Most Out of Handheld Batteries," "PSK 31," and "All About Ham Radio on the Air Awards" are covered in the magazine, and it is available to all instructors teaching classes.

Ham instructors who have traditionally purchased their training materials from Radio Shack™ are finding a new selection of component products in the place where the original entry-level books were once available. Most Radio Shack stores will no longer carry ham radio training materials, yet the materials are still available at discounts for the registered amateur instructor.

A nationwide database is beginning to fill with ham class dates for prospective students to peruse. If you are teaching an upcoming class and want some free publicity, log onto [www.haminstructor.com] and get registered!

Once you are registered as an amateur radio instructor, you will be asked about your upcoming classes and what you may need for class supplies. These supplies will be shipped with your order for training materials, including the Gordon West books, audio cassettes, W5YI and West computer courses, West code cassettes as well as code on the CD computer program, plus other training materials. By popular request, the Forest Mimms book on basic electronics makes a great lab book for beginner students as well as upgrade students.

You may also bring in the new instructor guide that parallels the Gordon West Technician class book where all of the 510 questions have been rearranged for easier teaching. The 29 subgroups of questions for Technician class cuts teaching time by almost 50 percent! Instead of having to jump around the question pool, the new book puts everything in logical teaching order.

Best of all, all of the free manufacturer charts, maps, coupons, and wall-size spectrum charts are immediately available from one location without you, the instructor, needing to contact individual manufacturers and hoping they can get your materials out before your upcoming class.

For questions about the program, contact Gordon West directly, Monday-Thursday, 10:00 a.m.-4:00 p.m., California time, 714-549-5000. Log onto [www.haminstructor.com], or call the toll-free ham instructor phone number, 1-800-669-9594. Your students will appreciate coming into a classroom with plenty of colorful charts and maps waiting for them at their desk seat. Stock up now and see how much easier it is to teach the entry-level Technician class question pool completely rearranged for easier instruction with the Gordon West training materials.

Test Your WX Savvy

What with all the weird weather lately, why not give these posers a try? (Answers at end.)

Continued on page 61

Got Noise?



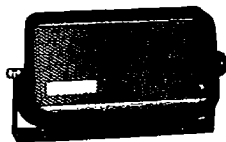
**Can't hear them?
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Solution: **ADSP²** — the affordable noise solution from SGC. ADSP² delivers top-of-the-line noise reduction for any transceiver. It works in your shack, in your car, or even in a portable station. Supply 12 VDC, connect your audio, and you've got the most advanced noise reduction available.

SGC ADSP²

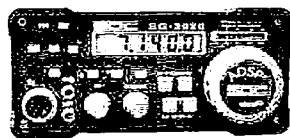
Noise reduction is essential on today's crowded bands. With up to 26 dB of noise reduction and three proprietary band pass filters, ADSP² boards can be fitted to nearly any transceiver. Or use the ADSP² Speaker with noise reduction levels selected from a single switch. Of course the legendary SG-2020 transceiver has ADSP² built in. Simple to use — just press the button to select your desired noise reduction. Adaptive Digital Signal Processing from SGC is the solution to your noise problem.

3 Ways to a Cleaner Signal



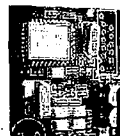
SGC ADSP² Speaker

Cat. # 70-14



SG-2020 Transceiver

Pat. # 05-04



SGC ADSP² Boards

10 Power Cat. # 70-11 HI Power Cat. # 70-12

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LETTERS

From the Ham Shack

Anonymous. Thank you very much for your catalog. There are definitely many interesting things that I will order. Unfortunately, I have to wait for payday to come around. This month, I have spent almost everything sending gifts to my wife for her birthday.

That, of course, has priority over everything. By the way, I am not joking when I say "payday." You see, I work for a company called UNICOR, a totally federally owned private corporation (sounds illegal, doesn't it?). At every federal prison, be it high, medium, low, or camp, there is a factory that produces everything from furniture (as we do) to the electrical harnesses for F-16 fighter aircraft.

My job is Head Quality Assurance Inmate and Production Coordinator. It sounds very prestigious, but the truth of the matter is that whenever there is any problem it always falls on my lap. This applies for staff (C.O.'s) or inmates.

I have always worked all my life, and this factory keeps up my management skills and has made me develop considerable people skills. Not everyone is an interested worker.

My salary is defined in the enclosed graph. I am a "P" grade, the highest, plus I have longevity and the advantage of working overtime. I work two shifts, the first from 7:30 a.m. to 3:45 p.m., and the second from 4:00 p.m. to 10:30 p.m. Last month I made \$708, but of this half is taken automatically for payment of restitution and fines. My position would be one of at least \$100,000 per year, and I assure you that I could justify that amount simply with the improvements made.

Well, many people do not understand that this is a business that the government is running. The 125,000 federal prisoners are backed by a \$30 billion budget, plus the revenue from UNICOR — approximately \$600 million last year. We supply all of the government agencies.

The status of "mandatory suppliers" for the government may change. Now UNICOR is looking into joint ventures with outside companies that have interest in supplying and participating in government contracts.

This country no longer has "justice" — it has a "legal system."

As always, I make these statements with trepidation because people always consider that a person who is in prison or has had some sort of conflict with the law is simply

bitter. There is no reason for the manner in which a person has to face a federal judge. It is proven that once an indictment is issued, it is all over. One should always try to cut the best deal possible.

The scary part of all this is the quality of people who are incarcerated. Now the division is much greater. The amount of drug cases is exorbitant. You would be shocked at the number of prominent businesspeople who are incarcerated and the manner in which all of their constitutional rights have been violated.

The federal government can incarcerate anyone they want. I was a believer in the Constitution, but it has been long dead. If the government wants you, they are going to get you — even if this means that the officers lie in court, fabricate evidence, or simply convict you of "conspiracy," something that is totally impossible to defend oneself against.

These are the facts; hopefully you will never have to face the government in court. Hopefully you will never be requested to do something for them that is illegal. Hopefully your assets will never be used against you to prove that there had to have been, to some degree, and within all probability, an illegal act in your past.

Believe me, I know what these people can do. A very dear and close friend of mine for many years was the only victim of the Iran-Contra fiasco. Oliver North pleaded and stated his innocence; he was approached by very important people of this government to simply plead guilty. He could not do this. His ethics and background would never permit it. Well, from a "time served" scenario it evolved to a 20-year sentence. There are so many stories that it is shameful to consider that this country's forefathers could look down and see the monstrosity that has come of their sacrifice and efforts.

If you like I will gladly stay in touch — many things are changing here in the Bureau of Prisons. All of the "privileges" have been taken away from us. Some people think that this is the military, mostly staff. But nonetheless, I see only chaos from all of this overregulation and a growing prison population. Look at the statistics and you'll see that we are now the leading country in the world for incarcerating people. Just as a note, California has more people incarcerated than all of Europe! This is absolutely ludicrous.

I wish you well.

John R.L. Walker ZL3IB. Sir, regarding the "Meter Made" article (73 *Amateur Radio Today*, March 2003) ... I read N2DCH's article about recycling discarded VU and similar meters with interest, having done this myself for home-brew dip oscillators and similar projects. However, I should like to sound a note of caution and advise your readers that many cheap VU meters do not have linear meter movements. I found this out the hard way when trying to use one as an extended range voltmeter; the scale reading was not linear between 80% and 100% FSD!

On checking other similar meters in my junk box, I found that nearly all of them suffered from this problem. After further research, I found that this was a deliberate design feature to prevent overloading and was brought about by the use of non-uniform magnetic pole pieces. They are still useful as indicators for many projects but be warned: Check their linearity if you want to measure voltage or current accurately. (ZL3IB is the editor of *Break-In*, the Official Journal of the NZ Assoc. Radio Transmitters in Christchurch, New Zealand.)

Richard Appleyard. Hello, Wayne. Here is an update on my daughter. I am writing to inform you that with the help of three hams and the Hammond Museum, she won at the regional level of a Heritage fair competition, and is headed to the National Heritage fair competition in Sudbury, Ontario. Her project is about Reginald Fessenden, and part of her display is a one-tube regenerative radio receiver. Other students came over while she was setting up the display, and comments like "cool," "neat," and "nifty" were heard while they watched the tube glow and listened to two radio stations on the headphones. The judges were quite impressed also with the radio and her research and knowledge of Mr. Fessenden. Tom Domalkas provided research material. Rick VE3BK assisted in fixing up father's mistakes, and Don VE3OCY, pulled hairs and remembered his younger days while doing modifications and repairs to get it to receive. The Hammond Museum provided the information to construct the radio. The next project for Katherine is to obtain her amateur license when she can find time in between choir, keyboard lessons, and sailing lessons. So, Wayne, young people do have an interest when shown something — especially outside the Internet. She enters grade nine in the fall. Will need a computer to keep track of her skeds.

NEVER SAY DIE

continued from page 5

water. For some reason I believe it is still against the law to hang California legislators. Both laws should be repealed as soon as possible.

I won't retread all the evidence I've published about this monumental scam. Fluoride in the water does not and never has helped teeth. It mottles them. What it does is make people more docile. As I mentioned last year, both the Germans and the Russians used it in their concentration camps to keep prisoners docile and apathetic. It's against the law in all European countries but Ireland, where those famous Irish tempers have to be kept under control.

By the way, tooth decay is one of the first indications of a lousy diet. My mother fed me a healthy diet as a child, so I had absolutely perfect teeth until I'd been in the Navy for four years, when I had my first filling. As a child I ate no sugar, soda pop, white bread, cold cereal, jam, jelly, little ice cream, and so on.

California children have twice as much dental disease as children in other states ... probably because of all that fluoride.

Oh, and fluorides also are tied to Alzheimer's. One extra benefit.

The Oil Curse

How come countries such as Saudi Arabia, Venezuela, Iraq, Iran, and other oil-rich countries are so amazingly backward? If you think about it, have you ever seen any product that's been manufactured in any of these countries in our stores?

What's happened is that the natural resource wealth is being controlled by a small group in each country and not used to educate their people, or invested in businesses. It's easier for those in control to enjoy the billions and use their power to keep the country closed off from the rest of the world.

As we've seen here in America, prices rise to meet the amount of money available to buy them. An American two-worker family today is making about the same in inflation-adjusted dollars as a one-worker family did sixty years ago.

Thus, in oil-rich countries prices are so high that factory labor costs too much to be competitive on the world market. So, few factories are built. Without industrial competition there is little technological innovation, so life for most people in those countries is grim. No wonder they are so jealous of us relatively rich Americans.

Wealthy Saudis prefer to invest in things like Harrod's department store in London rather than a business in Riyadh.

Oil is a curse for most of the people living in these countries, not a blessing.

Something Fishy?

The Navy has been training some new recruits to look for enemy divers to protect their ships against underwater attacks. Sea lions are being trained to find divers, attach a clamp to a leg and release a floating marker. They're also training dolphins to spot underwater mines and divers planting explosives.

Micro Solar Cells

Spherical Solar of Cambridge, Ontario, is making solar cells of tiny silicon beads of silicon sandwiched between aluminum foil, and sealed on both ends with plastic. The result is a denim-like fabric that can be draped over almost any shape to generate electricity. The claim is that this will obsolete solar panels.

Will their jackets be powering our kids' DVD players in a few years?

Any developments that help bring down solar energy costs are welcome.

El Cheapo Solar

Hey, keep those clippings coming. You know what I'm interested in ... almost everything.

Anyway, a reader sent one about scientists at the Indian Institute of Science in Bangalore having developed a new kind of solar cell. It's a copper-indium-gallium-diselenide (CIGS) mix. It's flexible and can be produced in rolls, so the estimated cost is about 40% that of solar panels.

I'd like to be able to go off the power grid in case Planet X, though way behind schedule, arrives, but am too thrifty (okay, okay, cheap) to go solar at today's cell cost.

Reality Education

When I look back over my sixteen years of formal education, I'm hard put to remember the courses I've taken which have benefited me ... in my business career, or in my personal life. Oh,

Continued on page 38

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Clamp-on DC Ammeter

A project suitable for ham radio? Of cores.

Measuring circuit current has always been part of the electronics side of ham radio, and ever since I was a little kid I've wanted to measure circuit current without having to open up a circuit to insert a meter. The project described here opens the door for ham experimenters to improve on and develop new and improved circuits for measuring current flow.

Clamp-on AC ammeters have been around for a long time and have really helped those who work on construction projects where AC is the primary source of power. However, not very many clamp-on DC ammeters have been made available for hams to use, although they do exist in the commercial world. I suspect there are several instrument design techniques available that allow a clamp-on technique to be used for measuring a direct current. Following my experiments with Hall-Effect sensors (73 Magazine, January 2003), the thought came to mind that the Hall sensor is a very simple approach

for making a clamp-on DC ammeter a reality at a cost well within the reach of an experimenter. The issue isn't whether you need a clamp-on DC ammeter, but whether one can be built easily and inexpensively with available materials.

As a quick review of Hall-Effect sensors, keep in mind that the sensor is capable of detecting the presence of a magnetic field regardless of polarity. In fact, the sensor is sensitive to the polarity of the field in addition to the strength of the field, and comes in two basic types, switch and analog. Switch-type sensors are used in applications involving device travel

limits, burglar alarms, and a wide variety of ON/OFF functions. The switch type would be a suitable choice for detecting the current flow, or loss of current flow, in many electrical/electronic applications.

Analog sensors may be used in a switch function but are designed primarily to sense the magnitude and polarity of a magnetic field that is present. The analog sensor is sensitive to a field that is moving (and rate of movement) with respect to the sensor's location. The output voltage response of the Hall-Effect sensor is linear between the plus and minus voltage rails, making it a great candidate for

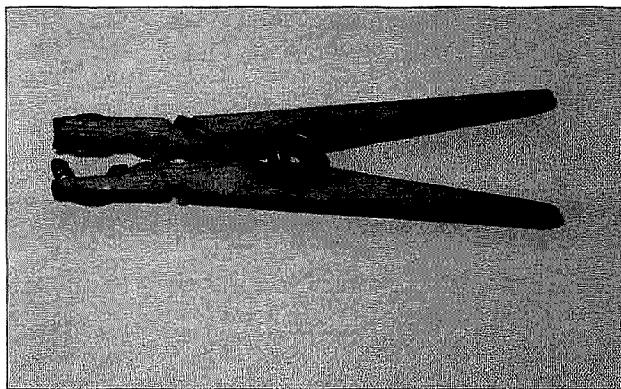


Photo A. A side view of the wooden clothespin and a mounted core.

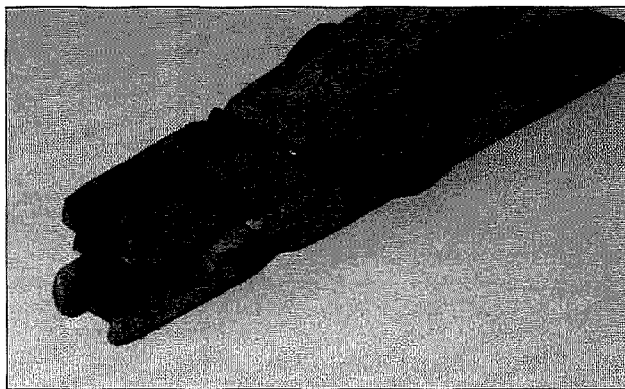


Photo B. Oblique view of a core mounted in a wooden clothespin.

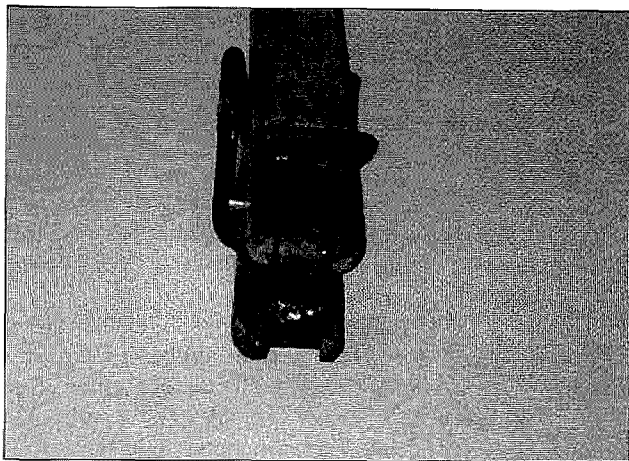


Photo C. A head-on view of the mounted core.

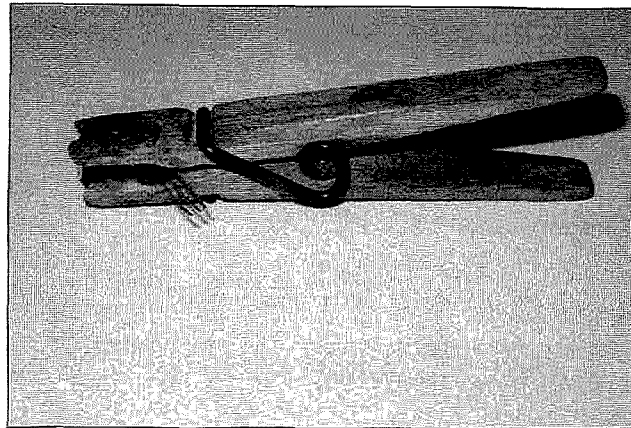


Photo D. View of the Hall-Effect sensor after it was cemented to one core face.

measurement applications. They also work well as a compass.

The output from a Hall-Effect sensor varies in two ways, and both must be understood when utilizing the sensor in a calibrated system such as an ammeter. The detected output response of the sensor will be logarithmic to a change in magnetic spacing between the magnetic source and the sensor. When the spacing is held constant, the output response will be linear to a magnitude change of the magnetic field.

The analog feature of the Hall-Effect sensor makes it a very good choice for use in a clamp-on DC ammeter application because it will sense the magnitude of the field produced by a current flowing through a wire. A magnetic field develops around a wire that is conducting a current, and the magnitude of the magnetic field is a direct function of the amplitude of the current flowing.

One of the previous difficulties experienced with the use of an analog Hall-Effect sensor was the issue of sensor drift/stability of the output as a function of device temperature. Fortunately, Allegro Microsystems, Inc., has developed a Hall-Effect sensor that is internally stabilized, and for this DC ammeter project the Allegro A3515 device was selected. As a result, the device's output signal information is as stable as the magnetic field being measured. To retain circuit stability, voltage regulation is a definite requirement for any circuit design utilizing an analog Hall-Effect sensor.

Cores and clamp

A toroid core may be utilized in several ways, but for an ammeter application, there are two simple techniques available. The first technique utilizes a wire wound several times around the core to multiply the effect of the magnetic field. Sensitivity to the current level is then a function of the number of turns of wire around the core to gain a desired magnetic amplitude response from the sensor. The second technique involves passing a single wire through the hole in the core and sensing the magnetic field produced around the wire as a function of current flowing along the wire. Obviously, the second technique produces the lowest sensitivity to current flow, but it is more adaptable to the clamp-on DC ammeter application.

Perhaps the most important part of the clamp-on DC ammeter project is the use of a magnetic core (toroid) to concentrate the magnetic field generated around a wire carrying a DC current. The magnetic field produced around the wire will be perpendicular to the direction of the current flow and will be concentrated by the core. Once concentrated, the magnetic field is allowed to pass through the Hall-Effect sensor that is placed in a gap cut in the core.

As an alternative scenario, consider the use of the Hall-Effect sensor without the presence of a core. If a wire conducting a current is placed close to the face of a Hall-Effect sensor, the

sensor will detect the magnetic field, but the field level may be way too low/small for the sensor to respond sufficiently for our application unless we use a very high-gain amplifier. In addition, the physical location of the wire in relation to the sensor would create a logarithmic response if the wire is allowed to shift position. By utilizing a magnetic core, we can gather and concentrate the magnetic field into a small area and reduce the magnetic field loss that would occur in the absence of a core. Likewise, the wire may be

Continued on page 12

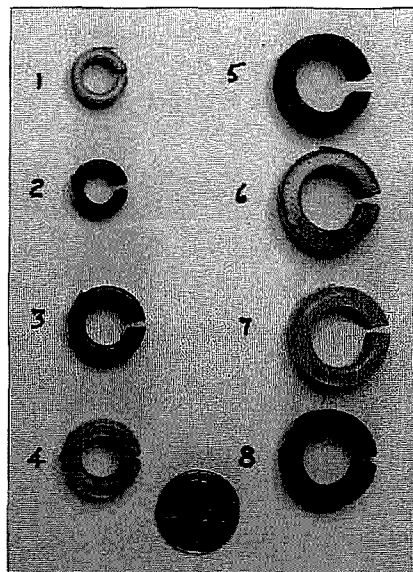


Photo E. Shown are eight randomly selected cores that were evaluated for use in the clamp-on DC ammeter project. A penny is shown for size comparison.

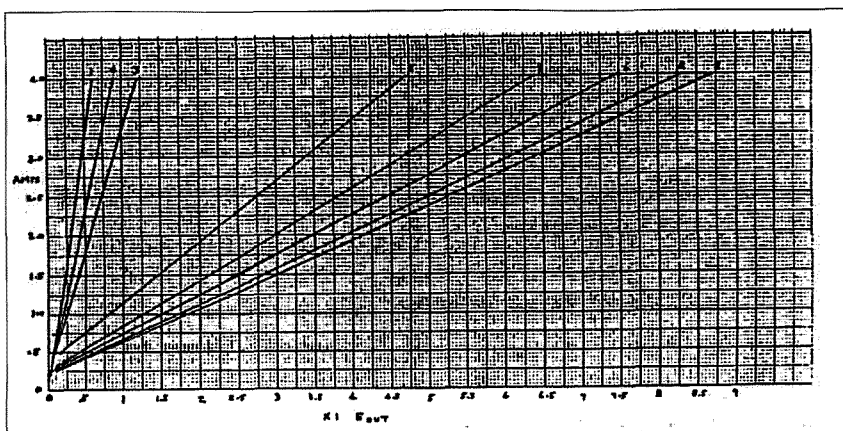


Fig. 1. Each of the available cores was evaluated for response with the results shown. Slopes to the left indicate the lowest response and the highest (greatest) response to the right. From left to right, core numbers are 1, 4, 3, 5, 7, 6, 2, and 8.

Clamp-on DC Ammeter

continued from page 11

anywhere within the core's opening for the sensor to respond linearly.

For the clamp-on ammeter project, a core was cut into two halves and mounted into a wooden clothespin for convenience as shown in **Photo A**. Cutting the core allows it to open up for placing a wire into the open hole of the toroid. Although the gaps in the core tend to reduce the efficiency of the field transfer, it is still the desired approach for the application. Maintaining smooth core faces that mate well is perhaps the most important mechanical aspect of the assembly. **Photos B** and **C** show other views of the core and how it's mounted into the clothespin. **Photo D** shows the

position of the Hall sensor after it was glued to one face of the core. Contact cement was used to hold both the core into the clothespin as well as gluing the sensor to one core face. Contact cement tends to remain pliable and acts somewhat like a shock absorber for the core. The core can move slightly under spring pressure, allowing the core faces to mate when the clip is closed.

Connecting wires are attached to the sensor wires and then are secured to the clothespin to reduce the stress on the sensor. Although the final assembly is a little crude and needs to be refined, it certainly works well.

With a wide variety of unknown cores available and not knowing exactly how each would work in the application, eight cores (shown in **Photo E**) were

evaluated, with the test results plotted in the graph as shown in **Fig. 1**. The cores that were evaluated were originally selected by color of the core material in an attempt to sort out the differences between ferrite (gray) and powdered iron (black). Because of a DC application, it was assumed that the powdered iron core would be the most suitable.

Each core was cut with a 0.064-inch gap so that it would barely slip over the sensor body for evaluation. The evaluation was performed using the Hall sensor mounted onto the circuit board and allowed to overhang the edge of the board. Known current values ranging from 0.2–4A was passed through a single wire inserted through the core being evaluated. Each core produced slight differences in response sensitivity to a given current, but all did react as expected, as shown in **Fig. 1**. The basic core material of those made from "black" material exhibited the greatest response. Cores 1, 3, and 4 showed the least coupling sensitivity, with cores 2 and 8 showing the greatest. Core number 2 was physically small and was more adaptable for mounting in the clothespin; therefore, it was selected for use in the project.

Even though cores 1, 3, and 4 exhibited the lowest response sensitivity to the flow of current, they did appear to be suitable for a clamp-on application where higher currents would be measured. The response linearity of all the cores indicates that any of the cores

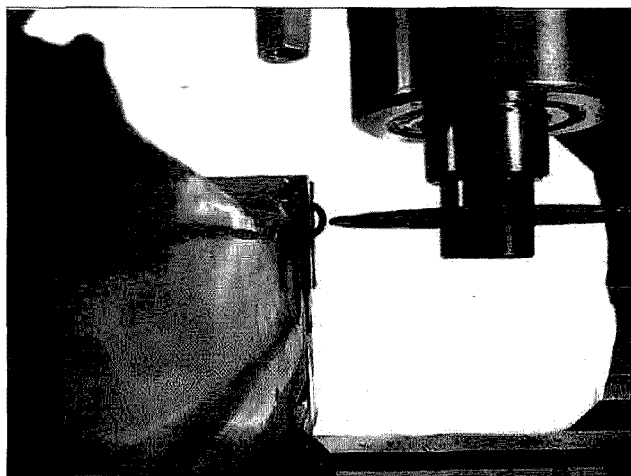


Photo F. View of a core being held by a mill vise prior to being cut by a cutoff disk.

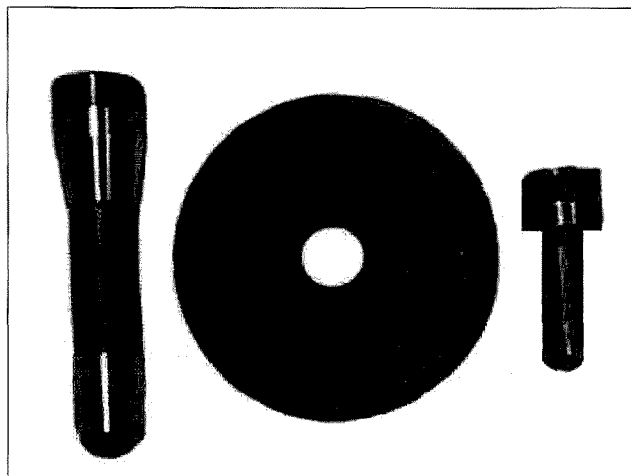


Photo G. Shown is a cutoff disk and two alternate, but suitable, mandrels.

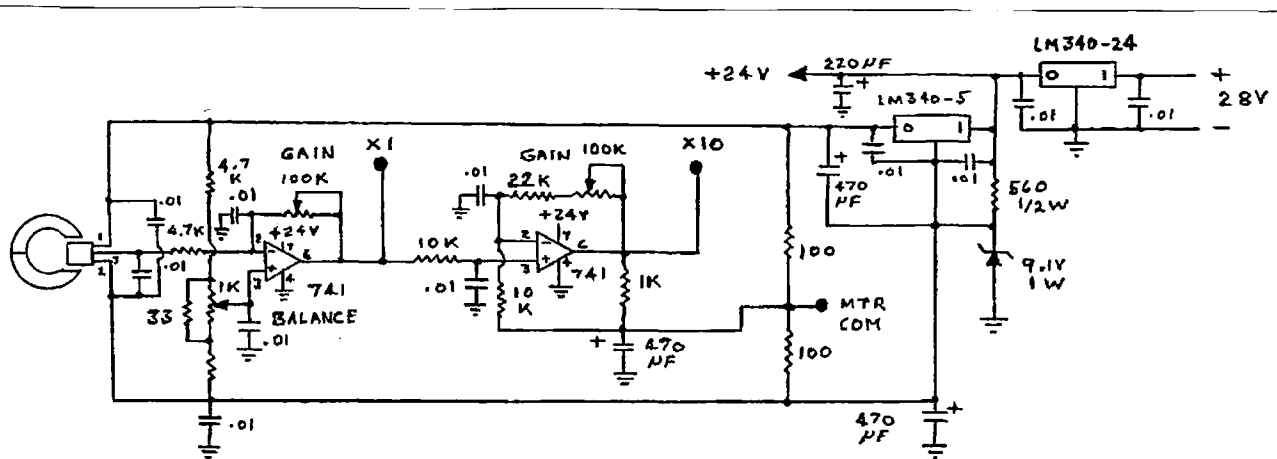


Fig. 2. Schematic diagram for the clamp-on DC ammeter evaluation. An analog Hall-Effect sensor is followed by two op amps to create both a "times 1" and a "times 10" measurement range.

evaluated would work well in the clamp-on application with an accommodation for circuit gain to achieve the ultimate objective.

Cutting the core

For this part of the project, I called upon Norm K6YPD to assist with the mechanical aspects. Norm was able to jig up the selected cores in a mill vise and cut each with a thin cutoff disk turning at a slow speed of about 200 RPM or less. Speeds of up to 2,500 RPM were tried with some success, but the lowest speed is recommended to reduce the risk of core damage. Operating the cutting disk at a high speed would cause a much higher instantaneous impact than when it is turning slowly.

Norm was very successful in cutting several cores in support of the project. The mill setup is shown in **Photo F**, although a drill press may also be utilized if proper jiggling can be arranged.

Photo G shows the disk and two alternate mounting arbors that are usable with the disk. Norm suggests that a disk be selected having a thickness of 0.064-inch that has a reinforced fine grit structure. Although Norm used a 4-inch disk, the diameter of the disk is not critical.

Holding the core in the mill vise requires some care. Because ferrite and powdered iron cores are "hard" and "brittle," some shock mounting is needed, though the core must be held very firm to prevent movement. Norm was successful using double-backed masking tape and/or carpet tape as a means of holding the core with minimum pinch pressure. The double-backed tape reduces the tendency for the core to drift/move when cutting pressure is applied — be patient, as the cutting process takes time.

Of concern during the cutting process is that powdered iron and ferrite cores can fracture both when clamped

of the split core is reduced by the amount of material removed. It is desirable to select a core that has a center hole larger than the maximum size wire anticipated to pass through the hole. Also, an additional 0.064-inch must be removed from one core face (or 0.032-inch from each sensor mating face) to accommodate the thickness of the Hall-Effect sensor. After cutting, the core halves should be placed together, with the Hall sensor inserted, to evaluate the mating core faces. If some face angle adjustment is required, a flat jeweler's pattern file will remove core material, allowing the core faces to become parallel when mated.

Electronics

The electronics involved with the clamp-on DC ammeter is very simple and utilizes a two-stage DC amplifier, as shown in **Fig. 2**. The amplifier drives a digital voltmeter set on the 20 VDC range, yielding a direct current to voltage conversion. Two current ranges are established by cascading two operational amplifier ICs (op amps). Current ranging is established by controlling the gain of the amplifiers to provide a nearly direct current-to-voltage conversion. For this application, I chose to use a pair of LM741 op amps, but I suspect that a wide variety of available op amps, including the LM1458, would be suitable for this application. Obtaining an

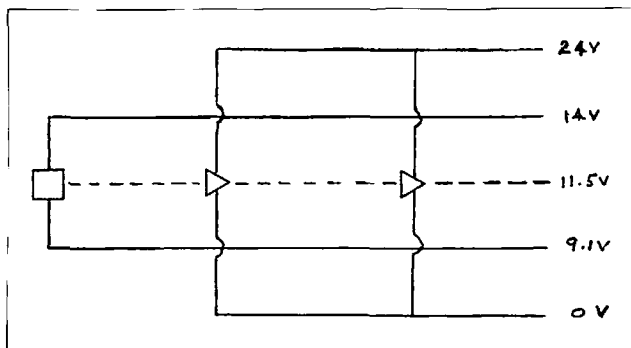
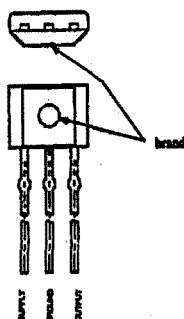


Fig. 3. Diagram shows the voltage distribution within the circuit.

too tightly in the vise as well as when struck by the cutoff disk. As Norm indicated, the objective is to "rub" the core to wear away material in the area being cut.

After cutting the core into two parts, the total diameter

3515



ELECTRICAL CHARACTERISTICS over operating temperature range, at $V_{CC} = 5\text{ V}$ (unless otherwise noted).

Characteristics	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	Operating	4.5	5.0	5.5	V
Supply Current	I_{CC}	$B = 0, V_{CC} = 5\text{ V}, I_O = 0$	—	7.3	10	mA
Quiescent Voltage Output	V_{OO}	$B = 0, I_O = 1\text{ mA}, T_A = 25^\circ\text{C}$	2.425	2.500	2.575	V
Output Voltage	V_{OUT}	$B = +3^\circ, I_O = 1\text{ mA}$	—	4.7	—	V
	V_{OUT}	$B = -3^\circ, I_O = -1\text{ mA}$	—	0.3	—	V
Output Current Limit	I_{OL}	$B = -3^\circ, V_{CC} = 5$	-1.0	-1.5	—	mA
Bandwidth (-3 dB)	BW		—	30	—	kHz
Clock Frequency	f_c		—	170	—	kHz
Output Resistance	r_o	$I_O < 2\text{ mA}$	—	0.2	—	Ω
Wide-Band Output Noise (rms)	e_n	$B = 0, BW = 10\text{ Hz to }10\text{ kHz}, I_O < 1\text{ mA}, C_{IN} < 100\text{ pF}$	—	400	—	μV

NOTE 1 — Typical data is at $T_A = 25^\circ\text{C}$ and is for design information only.

NOTE 2 — Negative current is defined as coming out of (sourcing) the output.

* This test requires positive and negative fields sufficient to swing the output driver between fully OFF and saturated (ON), respectively. It is NOT intended to indicate a range of linear operation.

Fig. 4. Spec sheet summary for the A3515xUA Hall-Effect sensor. Note carefully the pinout connections as related to the brand and package shape.

initial stage gain of 50 or higher, low noise and DC stability are the critical factors involved. For my application, the LM741 was quite satisfactory though not the ultimate answer for stability and noise immunity. I did find that voltage regulation was a very important factor, and to gain it,

voltage and still require only a single external voltage source. My criteria were met by using a 24 V regulator. Also, the external supply voltage has to be above 26 V for the desired regulation stability. Fig. 3 shows the general voltage distribution that appears in the circuit. Though appearing

I utilized two voltage regulators and a zener diode. Because the Hall-Effect sensor requires a very stable supply voltage operating between 4.5 V and 5.5 V, a 5 V regulator was used strictly for the sensor. The output of the sensor must reflect as accurately as possible the magnetic field developed around a current-carrying wire, and any supply voltage variation or noise voltage will shift the output indication.

One of the issues that I ran into with the project was in selecting the higher voltage regulator for the op amps that would provide a "split"

complex, the voltage distribution and ultimate stability were the real criteria. A sufficient output voltage swing is required to enable a suitable current measurement range, and that required the split voltage supply for the op amps. With that in mind, an LM741 can swing to within about 2 V of the plus/minus voltage rails before the output flattens.

Some care must be taken to correctly identify the leads of the Hall-Effect sensor during installation. Because of the flat package, it is very easy to reverse the connections to the device. Fig. 4 shows the device, its shape, and the leads for clear identification. The major keys to identification are the label marking, or brand, on the face of the device, and the package wedge shape. With the brand facing you and the leads pointing downward, the left pin is #1-Vcc, the center pin is #2-ground, and the output pin is #3, to the right.

A 2.5 V (approximately $V_{CC}/2$) output from the Hall-Effect sensor (in the absence of a magnetic field) establishes the "zero reference" operating level for the op amps, and a resistor divider between the 5 V rails establishes the "zero reference" for the second op amp and the digital voltmeter. Of course, the 2.5 V level from the sensor will shift some in the presence of any ferrous object. Placing a core around the Hall sensor will shift the zero point a small amount, requiring a rebalance of the amplifier. After circuit construction and the core is placed over the

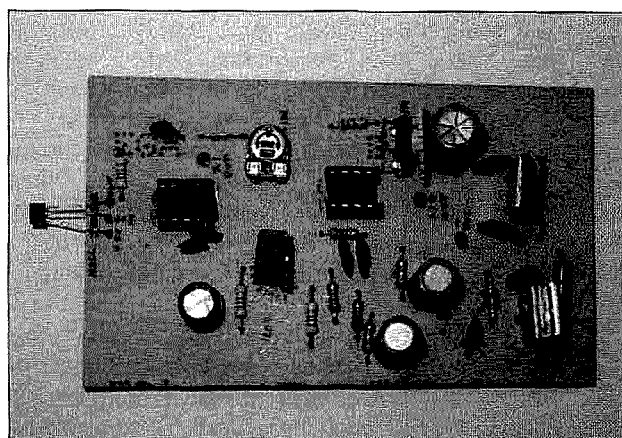


Photo H. Top side view of the clamp-on DC ammeter's evaluation circuit board.

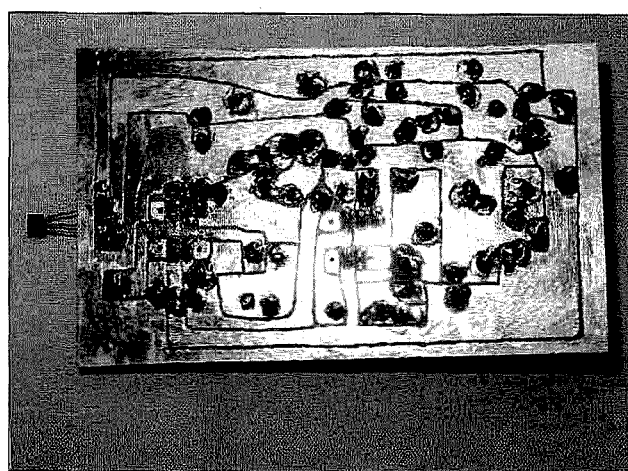


Photo I. Bottom side view of the evaluation circuit board.

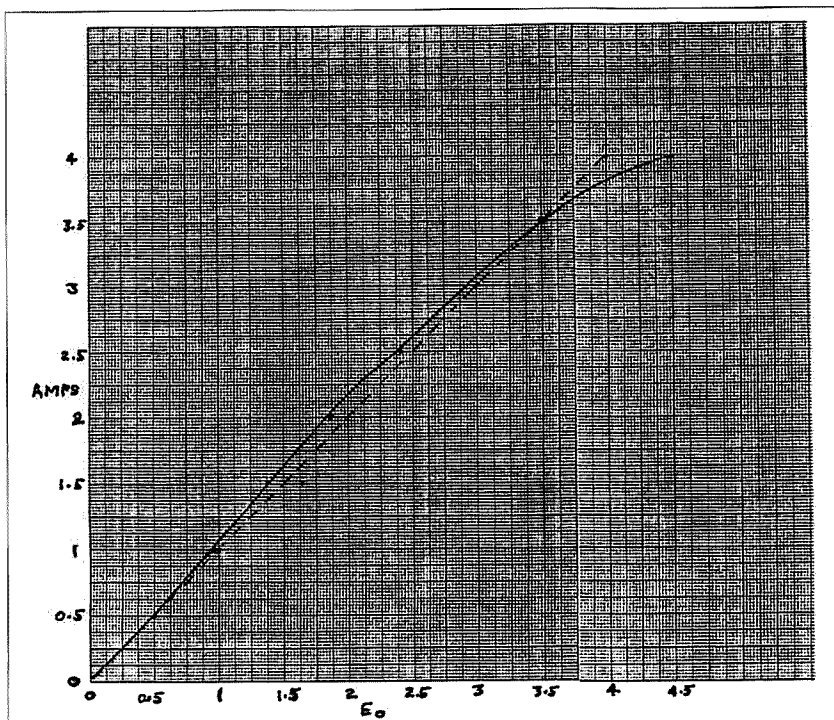


Fig. 5. X1 calibration response curve for measured current from 0–4 amps. The X1 gain was adjusted/calibrated at the 3.5 A value.

Hall sensor, the balance pot must bring the circuit to a balance. If the output from the sensor is a little too far above or below 2.5 V for the balance pot to correct, then a balance compensation may be required. Note that a 4.7k resistor is used on each side of the balance pot to assist in creating a vernier control over the balance adjustment by reducing the voltage across the pot. The center position of the balance pot may be restored by connecting a resistor in parallel with either the upper or lower 4.7k resistor. Select an appropriate resistor value that allows the balance pot to position itself near the center of rotation. Also note that a 33-ohm resistor is used in parallel with the balance pot. Again, the objective of the parallel resistor is to assist in making the balance pot a vernier adjustment by narrowing the voltage value across the pot. The values of the 4.7k resistors and the 33-ohm resistor may be shifted as desired to create a smooth vernier control over the balance adjustment range.

A negative aspect of this type of circuit design is that external ferrous objects such as screwdrivers, tools, metal

fenders, etc., will upset the circuit balance. The circuit and measurement capability remains the same as long as the amplifier's balance can be achieved. As a plus factor, the sensor's linear output response is greater than the op amp's voltage rail limits. In other words, the op amp response will reach saturation and "flat-top" before the sensor has reached its swing limit.

When in operation, the core's mating surfaces vary some from measurement to measurement, causing a slight variation in the meter's ZERO setting. A slight adjustment of the balance control corrects that error. Except for accurate current measurements, an absolute circuit balance is noncritical.

Photo H shows the top and **Photo I** shows the bottom side of my test board that was cut/patterned with a dental burr. As shown, my preference is to leave as much copper on a test board as possible. There are times when a new trace section may be needed and the extra copper on the board can circumvent the use of a long jumper wire by cutting a new trace. Building the circuit on a circuit board is not necessary, but mechanical stability and short

lead lengths are probably important since the amplifier operates at a fairly high gain level. Other than for mechanical stability and voltage regulation, there is little in the circuit that's critical.

Calibration/response

During my testing phase, the clamp-on DC ammeter was able to detect the presence and absence of a current as low as 10 mA, but the amplifier's lack of noise immunity tended to override the ability to "measure" such a low current value. However, measurement capability and reliability improved greatly as the current value increased.

Calibration of the project is accomplished in three steps. The first step is to set up a known current around 3–3.5A for the X1 range. The gain of the first amplifier is adjusted until the digital meter indicates the known current value. For the second step, the current is decreased to a value in the range of 150–200 mA (let's say 200 mA) and with the digital meter switched to the X10 output, the gain of the second stage is adjusted to obtain a reading of 0.2 V.

The third step is a verification step used to fine-tune the gain adjustments of both amplifiers by repeating the first two steps. Because of the interaction between directly coupled amplifiers, some minor adjustment changes are expected to occur during the first calibration pass.

Although the gain of the first stage is dictated by the core's response sensitivity, the basic stage design gain is between 10 and 50. It's possible to be higher and/or lower to meet the need. For the second stage, the gain is desirably set to a value of 10 in order to maintain the X1 and X10 multiplier relationship.

Figs. 5 and 6 show the calibration response curves that I obtained using core #2. Please note that the X1 calibration curve, although nearly tracking the absolute current "dotted" line, does swerve some, indicating an error in reporting the exact current that is being measured. Of most concern is the response deviation from the norm at current values below 3.5 A, assuming 3.5 A to be the upper measurement value. X1

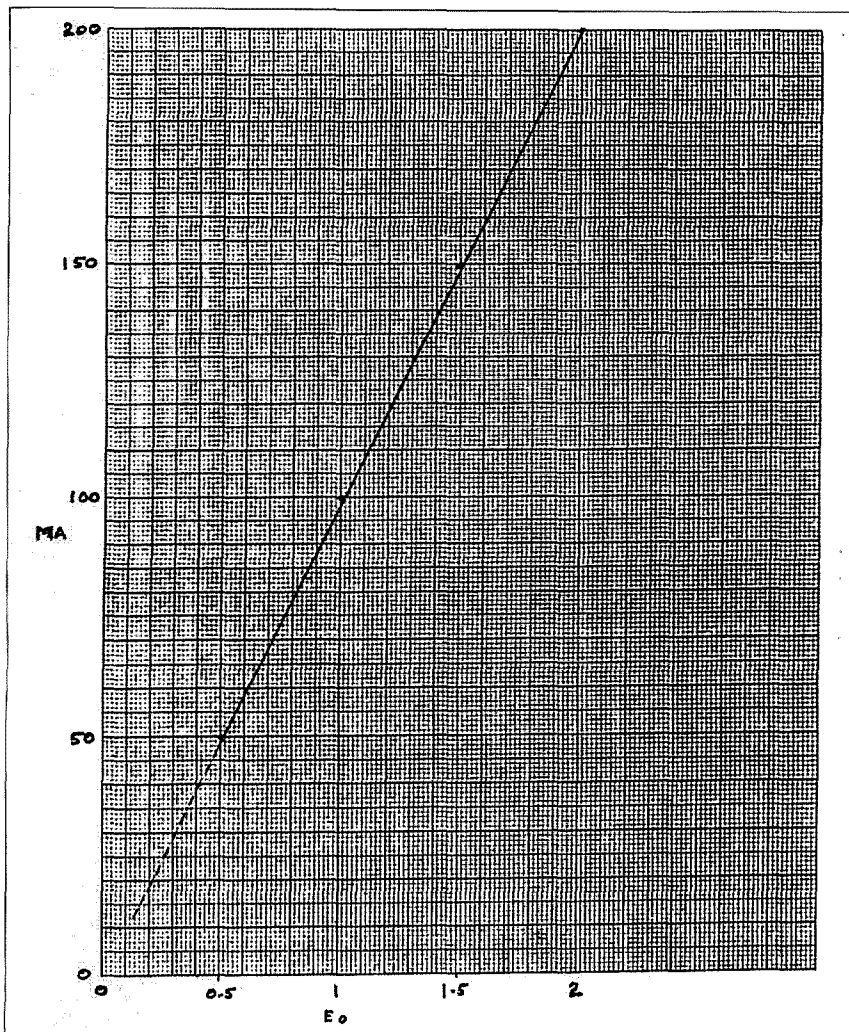


Fig. 6. X10 response curve for currents measured from 0-200 mA.

calibration for Fig. 5 was done at exactly 3.5 A to achieve the tracking curve shown. If greater measurement accuracy is desired for current values below 3.5 A, then the X1 amplifier gain may be adjusted with a known current between 2 A and 2.5 A. Such an adjustment would provide a reasonably accurate indication up to the calibration current value. Above the calibration value, the accuracy will decrease with increased current values as indicated by the shape of the response curve. Although I didn't sort out the reason for the response curvature, I suspect that it is related to the LM741's response, since the Hall-Effect sensor is linear from rail to rail, and neither rail was reached during the test.

Linear calibration response is achieved in the X10 range up to 200 mA

and is shown in Fig. 6. As long as the gain of the first amplifier is set to provide an accurate response for a current at 1 A or higher, the X10 range will provide a linear response.

Conclusions

After wanting a clamp-on DC ammeter for a long time, having one available has been a real treat for me. Although I didn't try switching my digital meter from the DC to the AC range, it's possible that the clamp-on project will work for both AC and DC applications. It has also been an interesting project requiring a lot of thought processing and investigation to make it a simple TO-DO type of electronic project. The only negative

Continued on page 57

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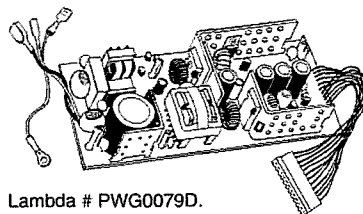
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The Ins and Outs of Parts Substitution

Part 1: Understanding the basics.

Since the beginning of the development and construction of electronic devices, components have been the key to a successful project. As time passes, parts for electronics are developed, modified, and then replaced with newly developed ones. Many of the older parts have been abandoned, leaving the ham experimenter of today with circuit designs and older equipment containing parts that are generally no longer available.

Regardless of the diminishing availability of “common” parts, hams are ingenious in the way they can substitute parts to make a desirable project work, regardless of when it was developed and what parts it was designed to use. Yes, as time moves forward, the availability of discrete electronic components appears to be decreasing. With many of us still building and experimenting with circuits developed and published in the past, we have to substitute for many of the parts, particularly semiconductors, in order to complete a chosen project.

Every ham has his own way of dealing with the parts substitution process based upon experience, knowledge of circuits, knowledgeable friends, network search engines, catalogs, substitution guides, and lastly perhaps giving up on the project. If you’ve read any of my past articles, you realize that I thoroughly enjoy working with electronic circuits, and that this effort has raised my sensitivity to the reduced sourcing of available parts for us to use in our projects. One of my many solutions was published in the April 2002 issue of *73 Amateur Radio Today*, describing my “ham junk box” and how

I save parts from various sources to create a personal parts buffer.

True, having a huge junk box of parts solves a piece of the problem, but it doesn’t help much in constructing a project with specified semiconductor parts that are no longer available. The solution then entails finding an available part that will work in the circuit. In the worst case, some circuit redesign may be required to accommodate the “new” part in order to make the circuit function. Although there is no simple answer to finding a substitute part, please follow along with the processes that I employ that help me hurdle the substitution barriers.

For a successful substitution process, you must be dedicated to finding a suitable part — and that generally means WORK! Here is a generalized listing that, if followed, will turn up a suitable part for most any circuit (although substituting a semiconductor for a vacuum tube, though possible, is reaching a bit far for this discussion).

- 1) Search for the exact part by number.
- 2) Utilize component catalogs to determine available parts.
- 3) Contact dealers handling obsolete semiconductors.

4) Use a network search engine to find a substitute.

5) Utilize network searches to determine part specifications, and/or to characterize the part’s parameters.

6) Utilize available part substitution manuals to find a similar part.

7) Use the Internet chat forums for part search/substitution information.

8) Examine the circuit to determine device function and requirements.

9) Identify available parts and overlay their specifications to the application.

10) Identify circuit differences — determine what, if any, circuit modifications are required.

11) Select a suitable/available replacement part.

Part search

Obtaining the desired part by indicated part number is always the first choice for a project builder. But when the part is not available locally, you have to widen the search area. Searching for a specific part requires that you have access to potential sources that handle the desired part. Finding an outlet is perhaps the most difficult part of the search unless you have saved a catalog or are on the distribution list

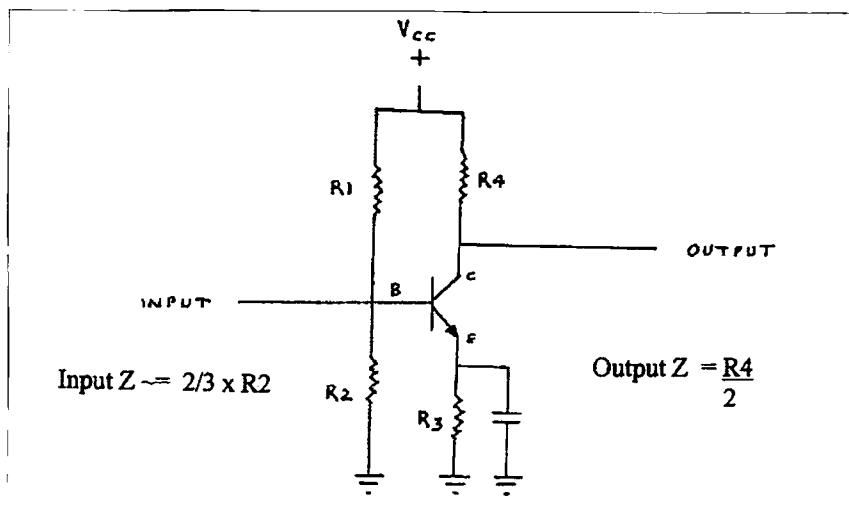


Fig. 1. Shown is a basic low frequency amplifier stage using an NPN junction transistor. All common emitter circuits are biased essentially as shown.

for supplier catalogs either in hard copy or on-line. Some of the more common catalog and reference suppliers that come to mind are All Electronics, Digi-Key, Mouser, Jameco, Newark, and Radio Shack.

When parts become obsolete, reference catalogs and data information generally get trashed. One of the solutions is to retain old reference material because it can provide the basic parameter information you require for making substitution decisions. The most complete and most accurate device specification data is published by D.A.T.A. Reference Standards. Copies of the older and obsolete D.A.T.A. books are found at swapmeets.

An aspect of what's happening today is that few outlets are available for single lot purchases. Of those organizations and distributors that do stock parts that we need, many have established a minimum order quantity that inhibits single part purchases. A group purchase helps resolve the problem sometimes, but in most cases we need only one or two parts to complete a project. Fortunately, the NTE line of parts is widely distributed and is readily available as a parts source for the ham community. An NTE on-line substitution/specification service is extremely helpful.

Some parts and specifications can be located by using the on-line search engines. Suppliers using the Web for their e-catalog listings are usually

smaller businesses that may buy in large quantities for distribution to the ham market, or they buy surplus and end-of-the-run items from larger companies. As a result of their purchasing technique, their inventory changes over time. This means that if the desired part was in inventory yesterday, it may be gone tomorrow. However, from my experience, these suppliers offer new parts at reasonable prices and need to be queried before moving on to the next level of search.

Word of mouth has always been a good way of finding that elusive part. With the number of hams who operate E-mail and participate in technical discussions, you have only to present the part number and someone will have a suggestion as to where it or a suitable substitute is available. Two

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Part #	Type	Power	Ic	Vce	hfe	Freq	Case
2N918	NPN	200 mW	50 mA	15 V	20	600 MHz	TO-72
2N2102	NPN	1 W	1 A	65 V	40	60 MHz	TO-5
2N2222	NPN	500 mW	800 mA	50 V	60	250 MHz	TO-18
2N3902	NPN	1.3 W	2.5 A	400 V	60	40 kHz	TO-3
2N3904	NPN	310 mW	200 mA	40 V	100	300 MHz	TO-72
TIP 29	NPN	2 W	1 A	40 V	100	3 kHz	TO-220
2N2907	PNP	400 mW	600 mA	40 V	100	200 MHz	TO-18
2N3171	PNP	75 W	3 A	40 V	30	1 MHz	TO-3
2N4404	PNP	5 W	500 mA	80 V	100	200 MHz	TO-39
2N3906	PNP	310 mW	200 mA	40 V	100	250 MHz	TO-92
MJE2955	PNP	90 W	10 A	60 V	50	2 MHz	TO-127
TIP 32	PNP	2 W	3 A	60 V	60	3 kHz	TO-220
Part #	Type	Power	Id	Vds	mos	Freq	Case
2N3819	Nchan	360 mW	10 mA	25 V	4000	400 MHz	TO-92
2N4416	Nchan	300 mW	10 mA	30 V	5000	400 MHz	TO-72
2N5245	Nchan	360 mW	30 mA	30 V	6000	400 MHz	TO-92
2N5545	Dual Nchan	250 mW	30 mA	50 V	4000	2 MHz	TO-71
MPF 102	Nchan	200 mW	10 mA	15 V	3000	200 MHz	TO-92
TIS 34	Nchan	360 mW	4 mA	5 V	2000	450 MHz	TO-92
3N128	Nchan	330 mW	25 mA	20 V	5000	300 MHz	TO-72
40601	Nchan	400 mW	18 mA	20 V	10k	450 MHz	TO-72
2N5797	Pchan	200 mW	10 mA	15 V	100k		TO-92
3N158	Pchan	300 mW	5 mA	15 V	2000		TO-72
3N162	Pchan	2 W	250 mA	30 V		45 MHz	TO-33
U110	Pchan	300 mW	1 mA	10 V	500		TO-18

Table 1. This is a table of randomly selected active elements. The characteristics shown are the basis from which a replacement/substitute part is selected.

such discussion forums are the QRP group, and the HF Pack. The hams that participate in the forums are very knowledgeable and extremely helpful (see references at the end of part 2).

There are several suppliers that handle obsolete semiconductor parts and will sell them in individual quantities to hams. These suppliers obtain their inventory from companies that clear out their parts inventory at the end of a production run in addition to obtaining the end-of-the-run residuals from the semiconductor manufacturers. When a part has been deemed obsolete for new production, it is held in company inventory for only a short period before it is either scrapped or sold off as surplus. Having dealers available that are willing to pick up the surplus inventory is a real boon to hams, because that action retains a

quantity of desired parts for an extended period of time. These surplus dealers are most easily found through Internet searches.

Part substitution

When the search effort has left us without a desired part, the next step is to find a suitable substitute. Finding a substitute part that will work in a particular circuit location doesn't necessarily mean that the desired part and the substitute are the "same" part with only a different identification. Though it's possible that the two parts were made from the same mask design, it would be a rare occurrence when the substitute part exhibits an exact electrical match. But in reality, it's the similar functional characteristics that count.

So, how do you find a suitable substitute part? Fortunately for hams, several manufacturers providing a line of substitute parts for the TV/VCR repair business make them available through local distributors. Formerly ECG and now NTE is the foremost supplier.

In support of the substitution process, conversion books have been published both in hard copy and online, providing a very extensive listing of substitute parts that will accommodate a multitude of commercial part numbers. Specification and data information for many parts may be obtained by doing catalog searches from information provided by D.A.T.A. Reference Standards, Digi-Key, Motorola, Mouser, National, Radio Shack, and Texas Instruments are examples. Even though some of the substitution manuals and catalogs are obsolete and out of print, having them available assists in obtaining relative specification information including pinout information on the older parts. I happen to have an Allied Radio catalog, printed perhaps in the 1950s era, that I have called upon for data on early transistors.

Substitution process

One of the problems that a ham will encounter with some substitute parts will be the pinout of the substitute part as related to the "desired" part. You have to be careful to evaluate both the mechanical and electrical part differences before installing the substitute part. In the case of a TO-92 transistor, the "old" and the "new" parts may "look" the same, but the pinout of the "new" part may be oriented as EBC, ECB, BCE and/or the less common BEC. Assuming that the electrical parameters are similar, then only the lead orientation needs to be accommodated for the substitution to take place.

In general, common junction transistors (also referred to as bipolar transistors) used at frequencies below 200 MHz are fairly easy to substitute because the electrical characteristics are sufficiently close, or similar, allowing normal operation within the design of a "typical" circuit. The major differences are related to the polarity of the

Part #	Type	Power	Ic/I _{ds}	V	hfe/hmos	Freq	Case
2N222	NPN	500 mW	800 mA	50 V	60	250 MHz	TO-18
2N3904	NPN	310 mW	200 mA	40 V	100	300 MHz	TO-92
Compare to:							
NTE 123AP	NPN	625 mW	600 mA	40 V	200	300 MHz	TO-92
2N3906	PNP	310 mW	200 mA	40 V	100	300 MHz	TO-92
Compare to:							
NTE 159	PNP	625 mW	1 A	80 V	180	200 MHz	TO-92
2N3819	Nchan	360 mW	10 mA	25 V	4000	400 MHz	TO-92
2N4416	Nchan	300 mW	10 mA	30 V	5000	400 MHz	TO-92
2N5245	Nchan	360 mW	30 mA	30 V	6000	400 MHz	TO-92
40601	Nchan	400 mW	18 mA	20 V	10k	450 MHz	TO-72
Compare to:							
NTE 312	Nchan	360 mW	15 mA	30 V	5500	400 MHz	TO-92
NTE 451	Nchan	310 mW	10 mA	25 V	4000	400 MHz	TO-92

Table 2. This table shows comparative data for selected parts that can be used to substitute for one another. Using this comparative process, a suitable replacement/substitute device can be selected.

device, e.g., NPN and PNP, and the base material of germanium or silicon. Substituting an NPN for a PNP, or vice versa, is not normally done, though possible by changing the circuit polarity. But with the number of available devices for substitution, switching device polarity is not needed.

We've reached the point in the substitution process where we must evaluate the device used in "our" circuit so that we can choose an available transistor for the one indicated in the schematic. Let's spend a few moments and look at a circuit and evaluate how we can substitute one transistor for another. The first step is to focus our attention on only the device in question that's shown in the schematic.

Most transistors are used in a "stage" that is electrically isolated from other stages by using coupling devices. When a transistor is used in an isolated stage, the voltage applied, the resistors used, and the resulting bias all apply to only that single transistor. When the function of the "stage" is understood, then substituting another transistor means that any transistor will function in the circuit as long as the circuit's functional parameters are satisfied.

Some schematics are pretty complex, as drawn, and it's difficult by eye to isolate the stage using the transistor

that needs to be replaced. If and when the "whole" of the schematic tends to create confusion, then you need to block out all of the schematic except for the subject transistor and its supporting components. One technique that I use is to bring my hands together, palms down on the schematic, and move them together until the area between the two thumbs and forefingers creates a near circle. Adjust the diameter of the circle until only the transistor and its associated resistors and capacitors are exposed. The circuit that's now shown in the viewing circle is all that we need to consider during the first step of substitution.

The second step is to look at the resistors around the device to gain an understanding of how the transistor is expected to operate in the circuit. The substitution question is, "What other device will work in that exact circuit?" For a circuit using a junction transistor, most any similar device will operate within the DC parameters — and that's 90% of the battle. "DC" refers to direct current, but when used in the context of this discussion, it refers mostly to the low frequency characteristics of a device that can be determined using direct current testing techniques. Then, based upon what you know about the transistor that's called for in the

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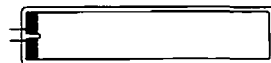
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schematic, you can do a specification overlay of characteristics with transistors that are available and then choose one to try.

Fig. 1 shows a simple NPN transistor amplifier with the supporting resistor network needed for the transistor to be biased for linear signal operation (Class A operation). When reviewing a circuit as that shown in **Fig. 1**, the input and output impedances may or may not be a factor in the substitution process. An estimate of the input impedance is close to the resulting value of R1 and R2 being in parallel, or about 2/3 the value of R1. The output impedance is close to 1/2 the value of R4.

Only the supply voltage polarity would be different if the circuit called for a PNP transistor. When substituting or selecting a transistor for the circuit, the parameters of frequency response, gain (both AC and DC), and Vcc are the most critical. For most transistors currently available for substitution, the maximum collector voltage value they can handle will normally exceed the Vcc called for in the circuit, removing Vcc as an issue. That leaves frequency response and stage gain as the only significant factors for device selection. Specification gain figures are noted as hfe (AC gain) and HFE (DC gain). DC gain is also noted as beta (β) in some specification sheets.

Many of the older schematics called for the use of 2N2222 and 2N2907 transistors. Both are silicon devices and may be substituted easily with currently available silicon transistors since the specifications will overlay as a near match. The 2N2222 and 2N2907 transistors were packaged in TO-18 cans and the newer devices available are packaged in plastic with the most common being the TO-92 package. The 2N39XX series of transistors are plastic substitutes for most NPN and PNP applications. An NTE 123AP is a suitable NPN substitute. Therefore, you need only to match the NPN-to-NPN and PNP-to-PNP for the circuit to function nearly as designed. For other old transistor devices, NTE substitution references would be a clear choice.

Some older RF circuit applications call for a 2N918 transistor because it would "sing" up to 800 MHz. Availability of the 2N918 (2N3600) is now limited, but better transistors are now available as replacements and they are the NTE 69 and the MRF 901 (NTE 64). The mounting configuration differs for each, but the electrical parameters will overlay sufficiently for the available devices to perform in many early circuit designs.

Parameter comparison

To demonstrate how to proceed with a device substitution, I've pulled some device part numbers from various old schematics in my file and have listed them in **Table 1**. If I desired to construct a project of interest using an old schematic, I would have to locate the indicated part or find a substitute that is currently available. If not available, I would then be faced with finding a suitable substitute that will work in the circuit. For most circuit applications the indicated characteristics like those shown in **Table 1** are all that need to be considered when selecting a replacement device. However, as a caution, when the device is used in a receiver or converter's front end, the device's noise figure must also be included in the evaluation. The lower the NF number in dB, the better.

To bring the parameter overlay process into focus, I've prepared **Table 2** to show a "parallel" listing of typical device characteristics for both transistors and FETs. For this chart, I've pulled data from **Table 1**. We'll assume that our schematic calls for these parts and our search has failed to turn up the indicated part. One of our options is to use the NTE series of parts to find our replacement, and to do that, I've selected some NTE parts for comparison. At best, the chart can only show a comparison of the "DC" characteristics with a reference to the highest frequency the device will operate. Beyond the "DC" characteristics, other parameters include noise figure, input and output capacitance, and case/package style. After reviewing the specific device parameters, decide which are the most critical for use in

the project circuit, and in the examples shown, in all likelihood the replacement part will successfully substitute for the part shown in the schematic. Some manipulation of the package leads may be required to achieve the proper connections.

Perhaps the greatest substitution difficulty will be encountered when the transistor shown in the original schematic is a germanium device. Although the circuit is simple and might appear as shown in **Fig. 1**, the device specifications will be lower than what most modern silicon transistors exhibit. As a result, should a silicon transistor be used to replace the original device, the circuit may perform differently than was intended. However, if the circuit is operating below 500 kHz, the substitution process will tend to be more successful than when dealing with an RF environment. Doing an analysis of the original circuit and overlaying a new circuit, such as that shown in **Fig. 1**, may provide enough clues to install a silicon transistor and obtain near-equivalent performance results. Of concern when using a silicon transistor is the base bias value that will be at about 1.7 V (0.7 V above the emitter) above ground for linear operation.

Where the real rub comes in during a silicon substitution is for a germanium device will be in the presence of RF. Although the circuit of **Fig. 1** may apply, the RF circuit parameters will differ greatly between germanium and silicon. Germanium transistors generally operated at lower signal swing amplitudes, with a DC level of typically 0.3–0.5V between the base and emitter, while a silicon transistor will require a signal swing above a DC level at 0.7 V. Likewise, the collector voltage of a germanium device is very low when compared to a modern silicon transistor. If the circuit design shows a Vcc of, say, 4.5 V because the transistor may have a max collector voltage rating of 6–9 V, then installing a silicon transistor may create the issue of insufficient Vcc for the silicon device to function properly in the original

Continued on page 57

How to Check Transistors with an Ohmmeter

Or: Let's cheat.

What the ham needs is a good go-no-go way of checking transistors with a piece of gear that he already has. Most transistor testers give you all sorts of exotic numbers and are expensive. What we want is a method to cheat and get a good idea of the quality of the transistor for the least fuss and cost.

First, let's examine the transistor to see what is available to measure. Fig. 1 shows the equivalent configuration of a PNP transistor. You will note that it is shown as two diodes, the emitter, and collector with a common cathode, the base. This is actually how the transistor is made. It operates by injecting a little current into the base which controls the number of electrons that flow from the collector to emitter. This, basically, is all there is to transistor action.

At first glance it would appear that, since the transistor is just really two diodes, we could just take an ohmmeter and measure the forward and backward resistances of the two diodes. We would set it up as in Fig. 2, and if the transistor were good we could expect results like those shown. This test will give us some information about the operation of the emitter-base and collector-base diodes but leaves us in the dark about whether it has even any gain or not. In other words, it does not

test the basic operation of the transistor. In fact the transistor can have a collector to emitter short and still have good diode action on both the emitter and collector.

Well, you say, "Why not measure between the emitter and collector, that will surely detect a short." Sure it will, but define a short. Remember that now we are not measuring the ratio of forward to backward resistance, but the backward leakage resistance of one diode in series with the forward resistance of another diode. What will be a good number for one transistor will be a dead short for another. There would be a tremendous variation in this resistance from a small signal silicon RF amplifier to a germanium audio power amplifier. And we still know nothing about whether the thing will amplify

or not. Besides, the manufacturer does not normally give such data anyway. What we want is a foolproof method of deciding if the thing is "transistoring" even though it was invented in Russia in 1933.

Well then, let's set the thing up in a circuit like it is supposed to work and squirt some current into the base to see if the current going through the collector-emitter leads does increase. If we are careful about polarity we can use our trusty ohmmeter to do this. An ohmmeter is nothing but a battery in series with a resistance and a meter. Assuming that we want to test an NPN transistor, we merely place the positive test lead on the collector and the negative lead on the emitter. A small amount of leakage current will flow which will be indicated as a resistance

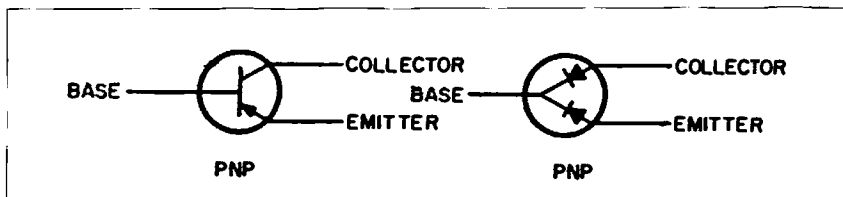


Fig. 1. At the left is the symbol of a standard PNP transistor; At the right is the equivalent physical configuration of this transistor. Note that it is actually two diodes tied to a common point, the base.

By popular request, reprinted from the March 1962 issue of 73 Amateur Radio. What types of articles would you like to see from the golden days of yesteryear?

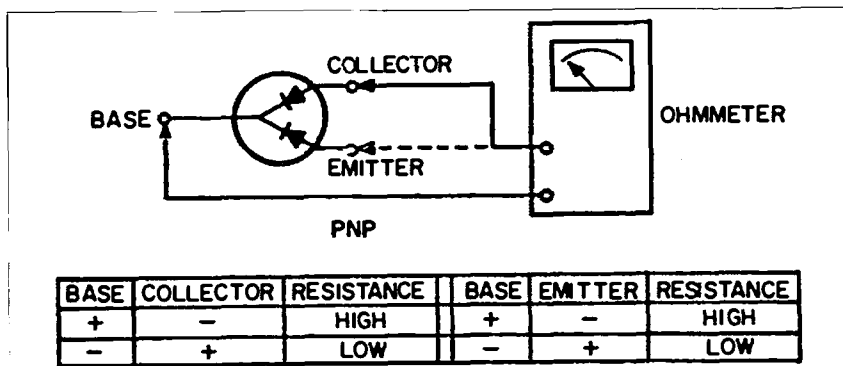


Fig. 2.

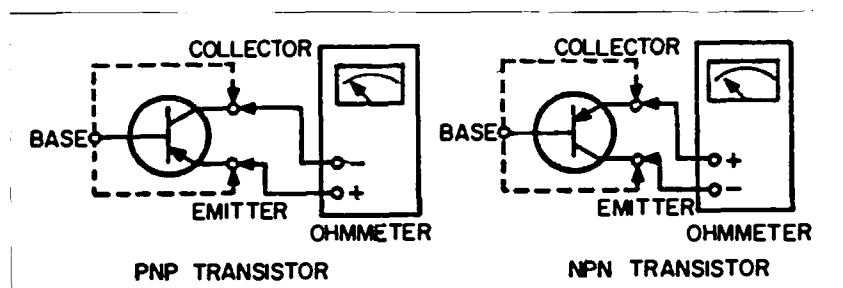


Fig. 3. With ohmmeter in $R \times 100$ scale (assuming that the meter uses a 1-1/2 volt battery), a good transistor will be indicated by a decrease in resistance when the base lead is touched to the collector and a small increase in resistance when the base lead is touched to the emitter.

on the ohmmeter. The theory says that if we apply a positive voltage to the base the current in the collector-emitter circuit should increase.

Well, that's easy enough to do, just push the base lead over until it touches the positive collector lead. If the transistor has any gain, the collector-emitter current should increase. Of course, since we are using an ohmmeter our indication will be a decrease in resistance. As a further check, push the base lead over and touch the emitter lead. This effectively grounds the base and the current in the collector-emitter circuit should decrease from the value of current with the base left floating.

This, of course, will be indicated as an increase in resistance on our ohmmeter.

Notice that all of these measurements are relative to each other — we don't have to have any data or "reference." Actually, in each configuration you are measuring a basic parameter of the transistor, and, if you happened to have the curves for that transistor, you could check them. In the first configuration with the base open the measured parameter is I_{ceo} , current through the collector-emitter with the base open. The second configuration with the base tied to the collector is actually a measurement of the transistor's beta. (The manufacturer usually calls this

hfe.) The third configuration is a measurement of I_{ces} , current through the collector-emitter with the base shorted to ground.

It is a bit hard to obtain exact numbers on these parameters as we are looking at a linear representation of basically a logarithmic device. If the collector-emitter current does go up when we apply the proper bias to the base, we know that the device has a beta and it is "transistoring." This information is augmented by the action of the current when the base is grounded. On a DC basis, we can now select a "hot" transistor from several of a similar type by picking the one that shows the greatest resistance change.

Now that we have examined the basic idea, let us look at the details. Fig. 3 shows the basic circuit using both NPN and PNP transistors. In each case, proper transistor action is indicated by the resistance going down when the base is connected to the collector and up when the base is connected to the emitter. Normally the resistance change when the base is connected to the collector will be several times greater than the resistance change when the base is connected to the emitter.

One important question that must be answered is which resistance scale should be used. This depends entirely upon the voltage used by the ohmmeter and the internal resistance of the ohmmeter. The midscale resistance reading on the ohmmeter dial is the internal resistance of the ohmmeter circuit on that range. The maximum current will therefore be the battery voltage divided by this resistance. On most ohmmeters, this is 1,500 ohms on the times one hundred scale. This coupled with the almost standard 1-1/2-volt battery means that no more than one milliamperes of current can flow. Since even the lowest-powered transistors are almost always rated at one milliamperes at least, this means that $R \times 100$ is the logical scale on which to start. It will be impossible to injure most transistors with one milliamperes no matter how it is connected.

On germanium transistors, especially

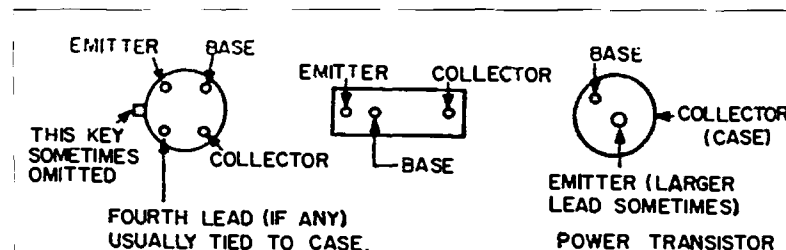


Fig. 4. Standard transistor lead configuration — all views of transistors from bottom.

Two Monitors Are Better Than One

Run tandem screens and really impress 'em.

What do you do with that old monitor when you upgrade to a larger one? That's easy to answer: Use it.

I decided to try this, so I installed the monitor card from an older computer into my Gateway 333c computer. It was a Trident 9645/96/80/9682/9385/9382/9385-1 pci. I installed it in a vacant slot on the motherboard. (Note: This older card limited my display definition to the ability of the old card, so I recommend using the same card as the original if you can get one.)

After hooking up the old monitor to

it and restarting the new computer, a window came up telling me that if I could read it, it was installed. It gave me the choice of putting it to the left, right, or on the top, so I chose left. I clicked on an icon and moved it to the other screen. It worked so well that I moved *all* the icons.

I brought up my MixW program by clicking on that icon, and the program came up. I found that you have to be in

the restore size to move it, but I did go to the blue area on the top and moved the running program to the other screen. It gives the ability to move anything to anywhere you wish it.

I like running the program when I am writing something like this in the main screen. If I want to, I can copy something from another program I

Continued on page 59

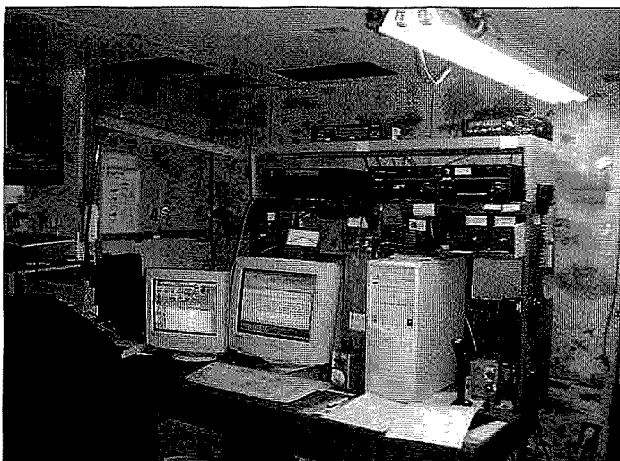


Photo A. A view of W6PNW's shack showing the two monitors at his operating station. MixW is in the monitor on the right, with parts of it in the monitor on the left, along with the word processor running in the left monitor while part of the desktop is showing.

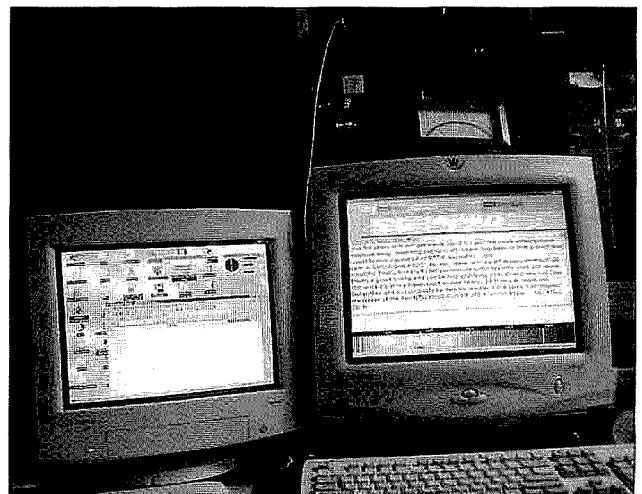


Photo B. Close-up view of MixW in the monitor on the right, with a word processor running in the left monitor. Notice that most of the desktop is still viewable.

Travels with Henryk — Part 14

Do Not Pass Go(a).

This small part of India is particularly interesting from the European point of view. Goa had been a Portuguese colony for some 450 years.

Until 1961, Goa had the prefix CR8, and one young amateur radio operator was particularly active there just before India took over. He was Luis Catulo ex-CR8LC. I met Luis in Lisbon, Portugal, in January 2002 where he is CT1CTZ today (Photo A). Luis is retired after many years of working for airport authorities

in Goa (Dabolim), Sao Tomé (S92), and Portugal.

I arrived at the airport of Dabolim in Goa one early December morning. After a few days of getting used to the very striking colors, constant noise, and the smells of spices, I set out to search for local hams. I had a short list of callsigns and addresses I found on [www.qrz.com].

One day at the bus station I saw a sign with a name that looked familiar. I

jumped into the bus and showed the address of Cyril VU2CY to the fare collector. He nodded “yes, yes” and announced my destination for other passengers, and soon a woman pointed to a newly built house and told me to follow her. But there was no antenna in sight. It was, however, Cyril’s house, and he welcomed me to step in. His quad antenna was disassembled and his ICOM transceiver was in Bombay for a memory refreshment therapy. So

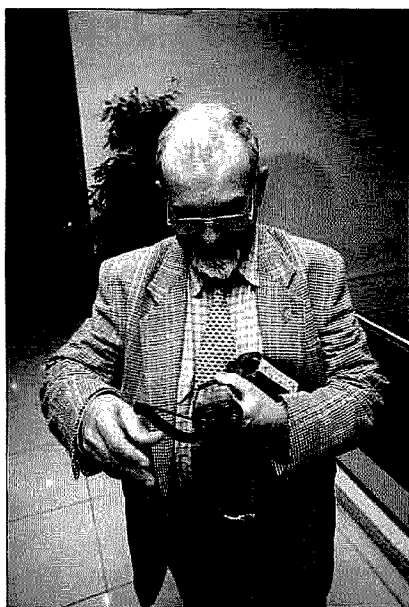


Photo A. Luis Catulo ex-CR8LC.



Photo B. Cyril VU2CY.



Photo C. Cyril VU2CY shows us where he strings his wire antennas.

all he had to play with was a miniature QRP transmitter which he had home-brewed (**Photo B**), and a few dipoles among the trees (**Photo C**). Cyril, a retired engineer, knew other active hams in Goa and could help me get in touch with them.

It was not difficult to find Didier VU2DM. He lives in the center of the capital city of Panaji, and the roof of

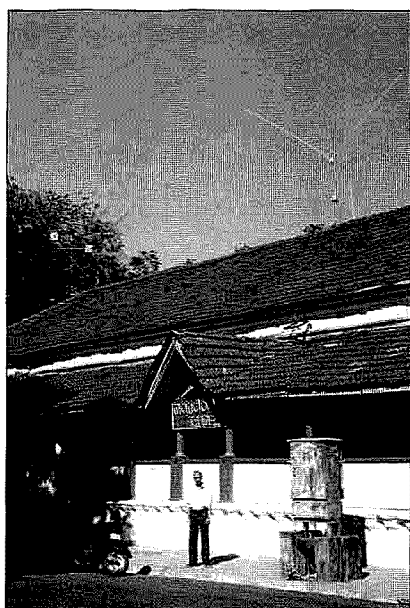


Photo D. The home of Didier VU2DM has several antennas on the roof.

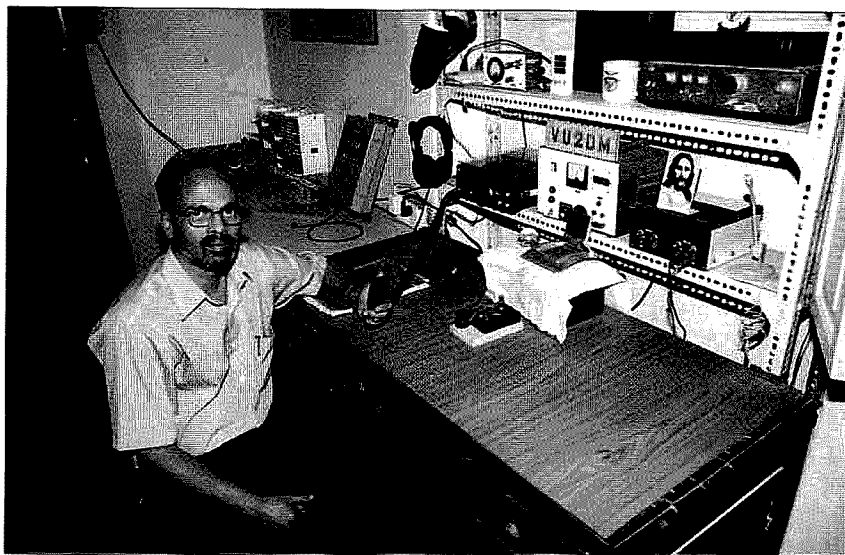


Photo E. VU2DM takes a break at his operating station.

his big house bears a few antennas — a quad, a delta, and a dipole (**Photo D**). His radio desk is quite impressive by Goan standards (**Photo E**), and evidence of his successful DXing, in the form of amateur radio diplomas, is on the wall. Didier knows Luis Catulo (ex-CR8LC), and they keep in touch, but his amateur radio interest started after Luis had left Goa.

The youngest of the trio, as I could only pinpoint three hams in Goa, is Alex VU2FCX. I took a taxi to get to his QTH, as the phone number I got from Cyril was obsolete. Unfortunately, Alex was not at home when I got there, but I persuaded his wife to

sit by the radio and pretend to talk to other housewives (**Photo F**). Actually, it is their 5-year-old son who likes to play radio amateur sometimes when Alex is away, but he presumably knew that this is not on his father's favorite list of things for him to do, so he refused to be photographed at the radio. Alex has a number of wire antennas (**Photo G**) and a Yaesu transceiver — a model that is very popular in India because of its small size and low cost.

Average income is quite low in India, and a radio transceiver is an expensive item here. The licenses are

Continued on page 59



Photo F. The wife of Alex VU2FCX models his ham radio equipment for us.

Easy Audio Tracer

How does this project sound?

Here is an easy-to-build project to build an audio tracer, an electronic device found on many technicians' benches and used to trace the audio path through a given piece of equipment. This simple project will provide a valuable work tool for the amateur builder, at little or no cost.

Computer systems have a way of becoming extinct shortly after the final payment is made or immediately after you learn how the software works. Whichever comes first! Without this phenomenon, there wouldn't be a trail of "orts" left after the new system has been installed.

Part of the replaced system is often a pair of speakers, one of which is powered by a DC wall transformer. This unit, or at least the pairs I have disassembled, contain a decent audio amplifier board with the usual controls, such as volume, bass, treble, and balance.

The builders designed them to be "cost effective" (i.e. cheap), yet provide a decent level of audio with acceptable quality. What a shame it would be if this technology were ignored and trashed.

Having adequate test equipment available to troubleshoot your latest project is a must for the amateur builder. Having to purchase equipment can be costly, even if used items are found at hamfests, etc.

Why spend the money for an audio tracer when there's a totally adequate device waiting for minor modification

for you to use! And the appearance is pleasing, too!

This is a very easy project to complete. The manufacturer did most of the work for us. All we have to do is modify the "audio input cable" to meet our needs. **Fig. 1** shows a typical amplified speaker. **Fig. 2** shows the attachments associated with the speaker. The input audio cable, either the one that fed audio from the audio board in the computer or the "jumper" that attached the second speaker to the first, has been modified.

The input jack on my speaker is an

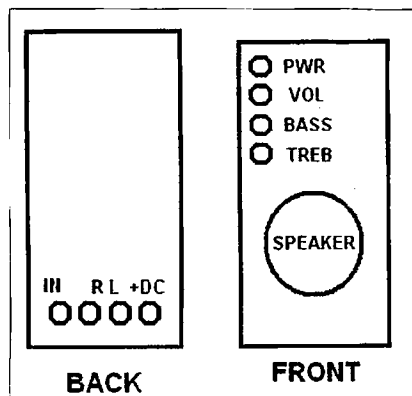


Fig. 1. Typical computer speaker pair. Inside is an audio amplifier.

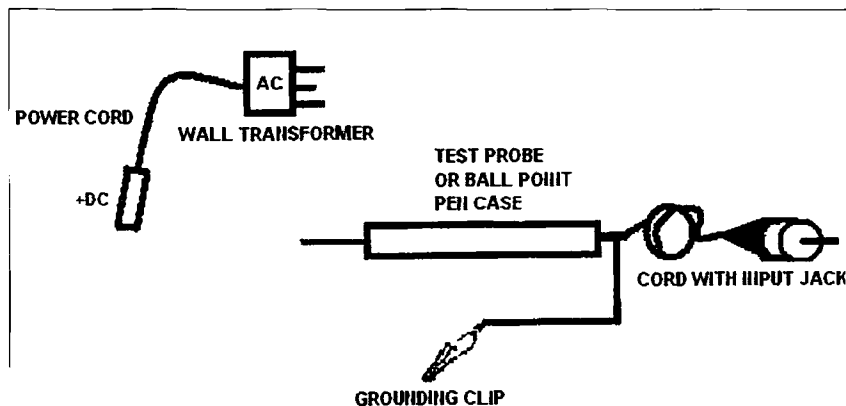


Fig. 2. Attachments, DC power source and modified audio cable with test probe attachment.

RCA type and remains untouched. The other end (another RCA jack, though it could also be a mini stereo-type plug) was removed. Parts required for the test probe are minimal. I used an old test probe I had, but a recycled ballpoint pen case works just as well.

Strip the outer jacket of the audio cable, taking care not to cut the shielding braid surrounding the inner conductor. I use the term "shielding braid" loosely, in that the cables used for computer audio are notoriously flimsy. Enough of the insulated center conductor should be exposed to extend through the test probe.

A solid wire test point (made from a 2" piece of house wiring) is soldered to the end of the center conductor. Feed the center conductor with the test point through the test probe and hot glue or epoxy it in place. File the end of the test point to a suitable point, and the working end of the probe is complete.

A ground clip must be attached to the shielding braid. Being "frugal" (my XYL says "cheap"). I salvaged a length of copper braid from the degaussing coil from a discarded TV set and soldered it to the frail shield on the audio cable. Be careful doing

this: The audio cable isn't friendly when too much heat is applied for too long! Use hot glue or epoxy to attach the ground assembly to the far end of the test probe. This will provide a measure of "strain relief" for the shielding braid.

Finally, attach your choice of grounding clip to the copper braid. I used an "alligator clip," or "croc clip" in the English publications. The choice of clamp is yours no matter which choice of reptilian description you care to use.

And there you have it. One audio signal tracer completed for the price of nearly nothing! Attach the test probe and cable to the audio input, plug in the power transformer, and begin chasing audio through your latest venture!

A word or two of caution: (1) Turn the audio gain DOWN before touching the probe to the circuit being tested. You will be amazed at how good these audio amps are! And (2), make sure that you have put the RCA jack into the proper input on the back of the speaker. You'll wait a long time to achieve results if you choose the wrong input. No, I won't admit to this one, but I do know about it, don't I?

Happy building!

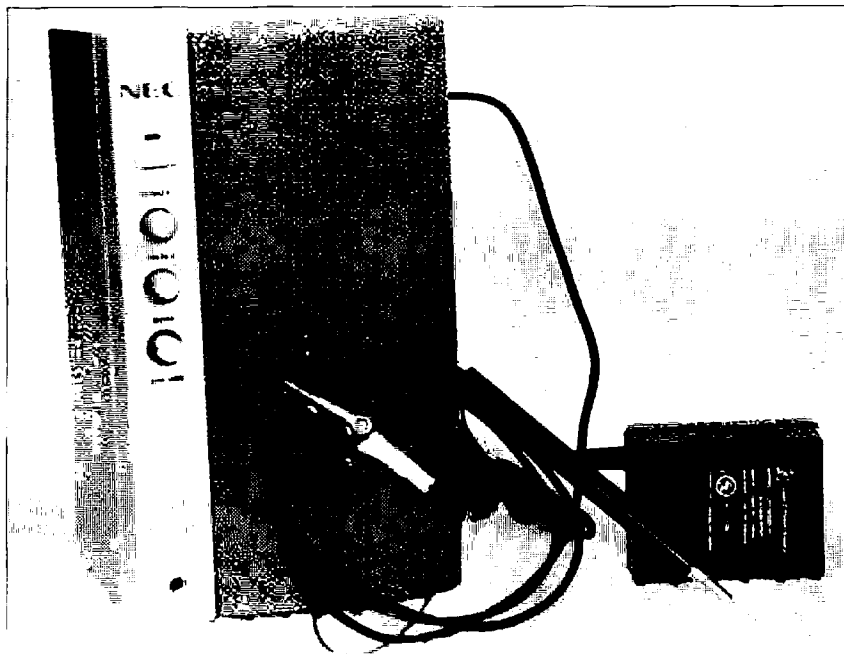


Photo A. Easy Audio Tracer.

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G.I. Joe and Mr. Morse

Try telling the military that Morse code is dead.

MORSE CODE IS DEAD! Or so says the fictional future headline if some Morse code nay-sayers have their way. Morse code is, in fact, not dead, and is in constant use throughout the world even now. Surprised?

While Morse code use has declined over the past several decades, Morse code is as vital to passing critical communications traffic, under special circumstances, as it has ever been.

Admittedly, Morse code use in mainstream communications has declined. In the 1990s, the U.S. Coast Guard discontinued monitoring the HF bands for SOS signals. Ships installed satellite communications consoles and removed Continuous Wave High Frequency (CW HF) radios. Morse code proficiency requirements were reduced in amateur radio, and a global movement continues to try to eliminate altogether the requirement for Morse code proficiency for access to amateur radio HF bands.

Significantly, the average age of those truly proficient in the use of Morse code is increasing. To many, these events denote the demise of this once-critical method of communications. However, there is some additional information about Morse code that is not generally known. Morse code is still used in many areas of the U.S. military, foreign militaries, and others.

In fact, Morse code used over CW

HF is still a critical communications method under circumstances where no other means will work. Morse code over CW HF is a vital, viable communications capability that is as necessary in the 21st century as it was during the 19th and 20th centuries. The fictional headline *should* really read, **MORSE CODE LIVES ON!**

Through several wars, Morse code was key to communicating on the battlefield, in the air, and aboard ship. Many current amateur radio operators learned their Morse code skills in World War II, or in later military service, and have refined those skills since then. I am relatively new to amateur radio and Morse code, having started in March of 2002 with my first HF QRP station and my first Morse code HF contact.

Since then, I have made approximately 160 QRP QSOs with operators up and down the East Coast, throughout the Midwest, and in Canada, Bermuda and the Virgin Islands. In a few instances, I have had the good fortune to "talk" to operators who were literally part of history as it was being made. One in particular was a communications operator with the army during the invasion of North Africa during World War II.

One of the key reasons I was drawn to Morse code is the ability to communicate with those who are part of our history. It is almost like reaching back into time. However, just because Morse code originated in the 19th century does not mean that it is obsolete today.

While it is a fairly well known fact that the military has used Morse code heavily in the past, many people believe that it has largely abandoned Morse code in favor of other, faster, more sophisticated means of communications. This is not at all true. Like the rest of society, much of the military has moved on to faster, higher-bandwidth modes for passing voice and data. Even with the high technology used in today's military, there are niches that lend themselves to simple, reliable methods of passing messages over long distances. I know from personal experience and research that the capability to send and receive Morse code is retained in the military, is still being trained in military schools, and is in use today in various military theaters throughout the world. Morse code is still a part of the U.S. military.

There are a number of military occupational specialties that either use Morse

code as part of a primary skill (primary job) or as an additional skill (secondary job). This fact cuts across all services. We all saw the army Special Forces in Afghanistan and Iraq moving around the countryside, organizing Afghan and Iraqi military resistance, taking down objectives and generally making life hard for the bad guys.

Army Special Forces have a military occupational specialty of 18E, communications sergeant, requiring proficiency in Morse code using CW HF as one of the job requirements. The 18E Basic Non-Commissioned Officers Course contains instruction in basic and advanced International Morse code.

The performance standard for success is 13 code groups per minute. This would not be required or trained if it were not an absolute necessity. Training time is at a premium and unneeded skills are not maintained as requirements for army specialties. Given the capability to pass message traffic using Morse code over HF with low power and minimal equipment, it is not hard to imagine why army Special Forces keeps Morse code in its inventory of very special skills.

Army Special Forces is not the only elite military unit in the army using Morse code; army Rangers, in some cases, do use it as well. I was browsing a Morse code key manufacturer's Web page one day and found they were offering military-style keys for sale. The keys were part of an army contract overrun. The keys were advertised as having been sold to the army for use specifically by army Rangers.

Now this may have been a ploy simply to sell keys, but given some of the missions army Rangers are called on to perform, Morse code over HF works just as well for them as for army Special Forces. The army also has other specialties that train and use Morse code today but for different reasons.

The army's Military Intelligence branch has a specialty called 98H, Communications Locator/Interceptor, and, to paraphrase from the [www.goarmy.com] Web page, the soldiers in this specialty are primarily responsible for performing and supervising the

detection, acquisition, location, and identification of foreign communications using International Morse code.

This is only one part of the specialty, but it is mentioned first on the list of duties. In addition, operating signal intelligence/electronic warfare equipment to detect, acquire, identify, locate, and exploit foreign communications devices transmitting Morse and non-Morse signals is also mentioned as key parts of this specialty.

You may ask why we need Morse code—skilled intelligence analysts in today's world. The reason is that much of the rest of the world still depends on Morse code to pass messages and perform vital communications functions for various militaries on a daily basis. The army is not the only service that still trains and maintains Morse code skills. The air force, navy, and marines do as well.

The air force requires Morse code in at least one specialty area, the Air Force Signals Intelligence Production Specialist. The Signals Intelligence Production Specialist must use the International Morse code and receiving and recording equipment to interpret these signals.

This specialty lists 27 semester hours of basic Morse code as part of the prerequisite training courses. For training in Morse code, the air force has specific Morse code training listed in the Community College of the Air Force 1999-2001 catalog for Morse code. The course title is listed as COM 1412 International Morse code and is described as basics of International Morse code with laboratory.

The air force also maintains a Special Experience Identifier (SEI) for Morse code proficiency. It is listed as SEI 378, Morse Code Qualified. To be awarded this Special Skill Identifier, you must be able to transcribe 12 groups per minute Morse Code.

Along with the army and air force, the navy and the marines also have Morse code requirements that are still trained today.

The navy has one job that is trained in Morse code: Signalman SM. The Signalman stands watches on signal bridges and sends/receives messages

by flashing light, semaphore, and flags. Training for this specialty includes lectures and practical exercises covering visual communications procedures and International Morse code.

In conducting research for this article I could not find any references to whether navy SEALs use Morse code. Given that the army's Special Operations Forces use Morse code, I expected to find that the SEALs would be using it as well. However, I could not find any references that indicated this was the case. I checked with the course manager for the Naval Special Warfare Communications course and he confirmed that the navy SEALs do not use Morse code and do not train it any longer, a fact that he did not necessarily agree with.

However, as course manager, he demonstrates Morse code to course attendees and strongly encourages all course attendees to become qualified on their own — as he believes that when all else fails, Morse code over CW HF will get through.

Along with the army, air force, and navy, the marines also retain Morse code skills. The marines have a military occupational specialty of 2621 titled Communications Signal Collection/Manual Morse Operator/Analyst. This specialty requires the completion of the Communications Signals Collection and Processing Course and the Morse Intercept Operator Course as two of the prerequisites.

Holders of this specialty perform communications electronic signals search missions, record the intercept of signals using electronic means, and measure, classify, and evaluate the signals. Operators must be familiar with communications intercept receivers, specialized computer software and hardware, and wideband converters in the process of collecting, recording, analyzing, and reporting a wide variety of intercepted communications signals.

While the marines and air force are primarily focused on transcribing Morse code as part of gathering intelligence, the army and navy still train and use Morse code to send traffic. The army is the only service that still

uses and maintains a capability of sending and receiving Morse code using CW HF.

While the military continues using Morse code, what use does the civil communications community have for it? The surprising answer is that the FCC still requires Morse code proficiency for some non-amateur licensing.

With all the discussion heard periodically about the "demise" of Morse code and the push to eliminate it from amateur radio as a requirement for HF band access, we are led to believe that the FCC has abandoned Morse code as a requirement in commercial licensing. This is not the case.

The FCC is still licensing First Class, Second Class, and Third Class Radio Telegraph Operators. Each of the Radio Telegraph Operators licenses requires that the applicant pass two Morse code Elements. Third Class and Second Class Operators are required to pass the 16 code groups per minute and 20 code groups per minute test. First Class Operators must pass the 20 code groups per minute and 25 code groups per minute elements.

Telegraph exams consist of both transmitting and receiving tests. Examinees must copy by ear and send by hand plain text code groups in the International Morse code using all the letters of the alphabet and numerals 0-9, as well as punctuation and prosigns. Those seeking certification must copy and send at the required speeds for one continuous minute without errors. The test is five minutes long.

According to the FCC Web site, the failure of any code test automatically terminates the examination. That the FCC is still dedicating resources and giving license exams for commercial radiotelegraph licenses requiring Morse code is another indicator that perhaps Morse code is not yet ready to be put on the shelf.

There is other evidence that Morse code is not yet relegated to the history books. In the world's militaries, there are many examples of HF capable radios that have CW HF (and Morse code) capability.

Jane's Military Communications

2002-2003 indicates that many countries possess CW HF capability. Australia has an HF radio described as the HF-90 Manpack HF/SSB/ECCM Transceiver. It uses the upper sideband, lower sideband, CW HF, frequency shift key, and ECCM modes. Accessories that come with this radio include a Morse code key.

Interestingly, this radio was not introduced until 1996. In the military, that makes this radio a fairly new addition to the inventory and one that will be around for decades. *Jane's Military Communications* further notes that many countries have radios and equipment that support CW HF. They include: Australia, Bulgaria, China, the Czech Republic, Egypt, France, India, Iran, Israel, the Russian Federation, South Africa, Italy, United Kingdom, and the United States.

Given that many other countries use equipment manufactured by one of the nations listed, I suspect that there are many more nations that also have CW HF capable equipment. In fact, the above-named radio built by Australia is listed as being in use throughout Africa, China, Europe, the Confederation of Independent States region, India, and southeast Asia. Given the prolific nature of military equipment sales to the world's armies, it is a fair assumption that CW HF-capable equipment is still in the equipment inventory of most nations. And given the proliferation of CW HF-capable radios, you can also assume that a fair number of countries are still practicing Morse code over CW HF as an operational communications means.

From my experience working within a multinational coalition of military forces, I know that Russia is a big user of CW HF and Morse code — perhaps, the biggest user in the world today.

In talking with visiting Russian communications personnel, I find that they consider Morse code over CW HF an extremely important capability and train hard with it on a continuous basis. I suspect that the Confederation of Independent States also heavily uses Morse code over CW HF given their relatively recent association with the Russian army.

Another country's military still using Morse code, albeit not as much as Russia, is the United Kingdom. Again, visiting communications personnel supporting communications in the British government state that Morse code is still a communications method in use in their armed forces. While it is somewhat difficult to ascertain with any certainty which of the various nations are actually training and using Morse code in their militaries, you can determine who is making and using Morse code equipment such as CW-capable radios as mentioned above and also Morse code keys/bugs.

With respect to the latter, the United States, China, Ukraine, United Kingdom, and some Eastern European countries all offer surplus military Morse code keys and bugs to the open market via third parties. Much of the equipment is newly manufactured. For countries with scarce resources, such as those in Eastern Europe, there must be a reason for the equipment to continue in production other than just selling it to secondary markets, and I suspect it is because of the domestic requirements of a given country's military. With various countries, including the United States, still employing Morse code over CW HF as a part of their military communications capabilities, a reason must exist that causes them to retain this well used method of passing messages. Perhaps it is because Morse code over CW HF can provide critical communications during times when more "up to date" modes can't get through.

An Army Signal Corps general once said, "Newer isn't always better. Even though it is old and slow, Morse is still the most reliable in difficult conditions." Even though the aforementioned general retired over ten years ago, his statement remains true — especially when the dependence on satellites, mobile communications devices, and personal wireless devices grows daily.

Several years ago, a satellite failed over the United States and caused one key service provider's paging network to cease operating. Tens of thousands of customers were left with no messaging

capability. This caused havoc with all who depended on the service, and the failure received large amounts of media coverage worldwide.

All this happened because one satellite failed. Now magnify that by the over 2,000 satellites aloft today that provide paging, data relay, voice relay, radio link relay, global satellite phone, mobile phone, etc., etc., and you have an idea of the magnitude of the disaster that would occur if we lost those satellites, even for a few hours. If the incident noted above had been related to electromagnetic pulse from a high altitude nuclear "accident," very little non-landline communications would be possible, and probably very little landline communications as well as much of the electronic infrastructure and most transistorized devices would be inoperable.

Electromagnetic pulse is a very strong burst of electromagnetic energy that can literally burn out small circuits, transistors, and components. While humans and animal life are left unscathed, unshielded electronics are rendered inoperable when exposed to an EMP event. In fact, for the first several days after an EMP event, only a mode that could work through high atmospheric noise levels and most likely with simple, construct-it-yourself equipment would get messages through.

Morse code over CW HF is recognized as a superior means of communications for both reasons. Simple, low-power CW HF transceivers, such as those used in QRP, are an ideal example of how to continue communicating after an EMP event.

If you work QRP (or even if you don't), you probably know that with a few pieces and parts scavenged from cast-off electronics devices, you can build a functional CW HF transceiver capable of sending and receiving Morse code transmissions. You need to have some knowledge of circuits and radios to successfully build such a rig, but many in the amateur radio community have this kind of knowledge.

With a minimal working knowledge of Morse code and low-tech transceivers, amateur radio operators could pass

message traffic even after EMP rendered all other communications inoperable.

There is a saying from Napoleon I's *Maxims of War*, written in 1831: "The secret of war lies in the communications."

While this is a bit extreme for an amateur radio article, the meaning is clear: We, as communicators, operators, and amateur radio advocates, should pursue skills that make us better at what we like to do, and also grow our skills. Learning and using Morse code and transmitting via CW HF and a key of some sort can make you a better operator, a more knowledgeable one, and more valuable as an emergency communications op — as well as a more capable one.

I don't think that anyone will argue with advocating continual development of amateur radio operator skills. We should all strive to learn more regardless of what our favorite mode is. Using Morse code over HF is fun, rewarding, and interesting. I will always remember my first HF Morse code contact and have had numerous other contacts since then that are also quite memorable. Morse code continues to challenge me and keeps amateur radio interesting.

Morse code is not dead. Far from it! It is still a means of passing message traffic in the U.S. military for some of our most skilled soldiers, and is still trained in U.S. armed forces schools. Many foreign militaries maintain Morse code proficiency as a primary means of passing critical military message traffic. Virtually every military is maintaining radio equipment in its inventory that has CW HF as a mode and is capable of sending Morse code.

Morse code over CW HF works well in very noisy conditions and could be the only means available if we find ourselves the victim of an electromagnetic pulse event or some other unforeseen disaster that makes our usual communications modes unusable. Under extreme circumstances, Morse code over CW HF can pass messages when no other method can get through.

As individuals we need to develop and maintain our proficiency in sending and receiving Morse code just as

if we plan on using it in some future emergency.

Many will look at this as very far-fetched. Most would have had the same thoughts about what happened on September 11, 2001. We need to ensure that we are ready for the next incident regardless of what that may be. Being prepared by learning Morse code is a small price to pay to ensure that we can continue to pass critical message traffic under less than optimal conditions.

After all, if the U.S. military deems Morse code skills as still being essential, perhaps the amateur radio community should as well.

Resources

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Continued on page 59

MFJ and the CW Jedi

An iambic beginner tries out the MFJ-564 paddle.

Wanting to join in on the recent QRP craze, I needed to get my CW code skills back into shape. Recently I stumbled on a CW tutoring program called MRX Morse Code. One of the features of MRX is that it allows you to not only practice copying Morse code, but to send it as well.

To practice sending code, a straight key, the computer key board, or an iambic key interfaced to the computer can be used. Details on key interfacing to the computer are included in the help section of the MRX software.

I had never used an iambic key before. To be honest, for me this was some sort of elusive mystery tool of the CW Jedi masters. I didn't even know for sure what iambic keying really was. I found out that, in a nutshell, it is the use of an electronic keying device that makes dits and dahs for you.

The most popular input device to the electronic keyer is the iambic key, or "paddles" as they are often called. Most of the newer radios have the electronic keyers already built-in. If you have an older rig, you can easily build your own keyer, or buy a prefabricated one. Most electronic keyers allow you to easily vary the speed and weight of the characters set to match the code speed with which you are comfortable. Many have built-in memory, so you may never have to repeatedly call CQ CQ CQ again.

Originally I learned code with a

straight key, and I knew they didn't call it "brass pounding" for nothing. After playing with the MRX program for a while, I figured, Hey, this iambic thing is here, let me play with it on the keyboard and see what it's all about. I was wondering why I had never tried this before, because it makes sending so much easier!

The biggest differences are that less physical movement is needed to send characters, the electronic keyer makes perfect dits and dahs for you, and it's just plain fun. It takes 132 key closures to send the entire alphabet and numbers 0-9 with a straight key. With an iambic paddle and keyer you can send the same number of characters with only 63 strokes!

For information on CW operation and iambic keying, I highly recommend that you check out PA3BWK's Ultimate Morse Code site. Be sure to read Chuck Adams K5FO's Iambic Sending article while you are there. Chuck describes the iambic paddles do's and don'ts, and offers setup and practice advice to get a beginner started on the right foot (or fist).

So now I was hooked, and I knew I would soon wear out my keyboard by

virtue of sending so much code. I needed an iambic key, so I hit the 'Net and checked out some prices. Yikes! Most are \$100 or better. After checking the reviews on the Internet, I narrowed my choices down to four models: the Kent, Benchner, MFJ, and, for portable QRP, the Vibroplex Code Warrior Jr.

The MFJ-564 was the only one in my price range. My impression from the Internet reviews was that this key was geared for people, such as myself, just getting started and on a budget. If you are one of the CW Jedi masters I spoke of earlier, then this may not be the key for you. I'm sure it is not going to equal a key costing two to four times as much. But I am also sure that it will get the job done.

I did learn that all keys have a different "feel," and what works for someone else may not work for you. I got the impression that if I were to continue working iambic CW, then I would eventually want one of the high dollar models anyway.

The MFJ-564 is manufactured by MFJ Enterprises. The current price is \$49.95 for either the chrome or the black-finished base. The unit is available direct

from MFJ or from most of the major ham radio retailers. I ordered the MFJ-564 with the chrome base.

Physically the unit seems to be somewhat of a take-off on the Bencher paddle. My research made it clear that even though these units may look similar, they are not. You will find that Bencher paddles are held in very high regard among the iambic enthusiasts. And as always, you get what you pay for, but in this case I was more than happy with my purchase.

The key came well packaged and looked clean out of the box. The unit had no marks, chips, or dings. A one-page instruction sheet was included. For a newbie, the instructions leave some details out, and they could have been more in depth on the setup and adjustments. No adjustment wrenches were included.

However, adjustments are easily made with an Allen wrench and a Phillips screw driver. There are no adjustments for spring tension. I suppose that the spring could be shortened to achieve greater tension, but I don't really see the need. Now on to the setup.

The first step of the instructions said to loosen the bottom pivot arm screw so that the paddles are free when squeezed. The screws were already loose, and no other information was given as to their function. More on these screws later.

I started to do setup and adjustments

to get a minimum of contact spacing and be sure the movement of the paddles felt right and everything lined up correctly. While doing this, I noticed the left paddle had an up and down rocking movement and the right one did not.

Further inspection showed that the pivot arm was not properly seated on the fulcrum points. The pointed needle bearings where the rocking fulcrum points are were spaced too wide for the recessed area of the nylon receptacle sockets in the pivot arms. This was causing the up and down sliding on the pin areas. I knew from my reading on using an iambic paddle that a very light touch and small contact spacing is desired to build speed. This vertical movement on the paddle could cause false keying with a small contact spacing and was unacceptable. However, it was easily corrected and not worth it to me to send the unit back for replacement. Here is all that was required to fix this problem.

First, I removed the spring and took the paddles and pivot arm assembly off. Next, I removed the main square block with just two bottom screws. One of the screws seemed to wobble like it was bent, but no problems were encountered. Next I used a very small adjustable wrench to gently bend the pivot pins (needle bearings) so the nylon brushing in the pivot arms fit squarely with no vertical play or sliding.

Once done, the pivot arm fit tight

and square on the pins. Then I reassembled the key and finished my gap adjustment. Chuck Adams recommended a very small gap set with just a piece of 20 lb. copy paper. That seemed a bit too close for my taste, so I used a 3 x 5 index card to set the gap.

The pivot arm screws mentioned earlier in the first step were a bit of a mystery. After getting the basic setup done, I realized they are possibly over-travel screws. If you have a really heavy fist then you could bend the contact arms and thus change the contact gap spacing.

These screws can be set to serve as a positive stop to prevent bending the contact arms. On my unit one of the screws is very loose and the other still quite snug. I may try some Teflon tape on the loose one to add some extra friction. Finally, I soldered a cable to the provided solder lugs under the base and quickly interfaced it to my PC for practice. It keys just fine.

Although I had a few setup glitches, I'm happy with my purchase. I feel it was worth the investment. I have seen these same units sell on eBay for nearly what they cost new! I didn't mind the extra tweaking involved to get it set up correctly. I'm sure I will disassemble it from time to time anyway for a good cleaning. If you want to get started with iambic keying or want a paddle to kick around with then this is it. Hats off to MFJ for providing a quality and economical tool for the beginner. This is the only paddle of this type available in this price range that I am aware of. Pick one up and give iambic CW a try.

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73

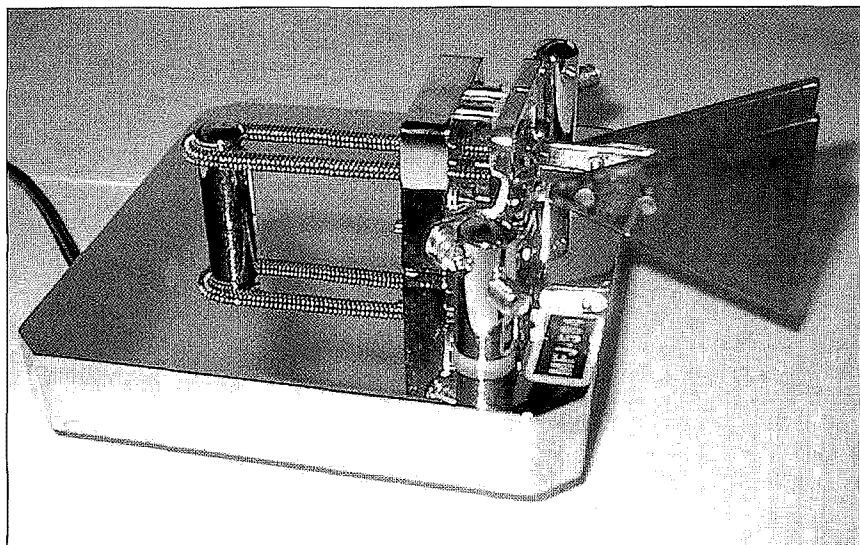


Photo A. The MFJ-564 iambic paddle.

The IC-703

Talk about choices! Right now, there's a slew of new HF transceivers on the market designed with the QRP operator in mind. This year at the 2003 Dayton Hamvention, Icom introduced their new IC-703 QRP HF transceiver.

The IC-703 is built on the same footprint as the Icom IC-706. In fact, Icom even states in their ads that the IC-703 uses IC-706 MKIIG operation instructions. If you have operated a 706, then the IC-703 can be operated without the manual.

So, just what is an IC-703? It's Icom's newest HF radio and their first entry into the QRP HF field. The IC-703 covers 160–10 meters. The IC-703 plus covers the above bands plus 6 meters. The IC-703 sports an internal antenna tuner that will tune balanced feed antennas (coax feed antennas, not random wire antennas) and the tuner requires no operating current once tuned.

DSP is also included in the IC-703. You get automatic notch and noise reduction built into the IC-703.

The IC-703 was put on an energy diet. On 9.6 volts, the current drain is only 300 mA! The IC-706 on the other hand consumed over 1.2 amps just on receive. The IC-703 is battery friendly. It's designed to work correctly with power supply voltage as low as 9.6 volts. Most of today's radios have a hard time running correctly when the power supply dips to 12 volts. I know my Ten-Tec Argonaut V gets upset at 12 volts. The IC-703 is a really good choice for portable operation with battery power.

Many modes of operation

The IC-703 can operate on SSB, CW, and AM and FM modes. The RF output on AM is four watts maximum.

The IC-703 also covers the entire shortwave spectrum. So, you can listen in on what's going on in the world as you backpack your way into the outback.

Other goodies inside the IC-703

Besides the stuff we now take for granted like dual VFO and memories galore, the

IC-703 also comes with a TXCO so you won't drift around in frequency when the radio gets too cold or too hot. That's something to take into account if you plan on running the IC-703 inside a tent on a cold November morning.

Since most QRP operation is on CW, the IC-703 sports a CW memory keyer. The keyer will hold 3 memories of up to 50 characters each.

Normally when you're camping, you usually end up with less than perfect antennas, but the IC-703 can help you pull in those weak signals with its sensitivity of 0.16 μ V at 10 dB S/N.

On the transmit side, the IC-703 will produce up to 10 watts of RF into a 50 ohm load. The IC-703 is smart enough to know when the battery voltage is dropping and will automatically drop the output back for you. The IC-703 will drop back to five watts at 9.6 volts.

Icom was able to get this and more into a package that tips the scales at four pounds four ounces. The entire transceiver is about six inches wide by two inches high. The IC-703 is about seven inches deep.

Putting the IC-703 on the air

If you have ever operated the Icom 706, then the IC-703 is child's play. They operate in very much the same manner, with minor differences between the two.

Putting the IC-703 on the air is quite simple, you select the band you want, the mode and away you go. There's no direct frequency input, so you must dial the frequency in with the main tuning knob. You can move up or down band by band by using the BAND buttons. You can program up to 105 memories with your favorite frequencies, making band hopping easier.

One of the drawbacks of the IC-706 is CW operation without the CW filter. Once

again, this problem pops up with the IC-703. Even if you only do CW as an afterthought, the FL-52A (500 Hz) or FL53A (250 Hz) filter is a must have option. But there's a problem: You can only install one filter inside the IC-703. So, you must decide if you want one of the two CW-only filters, a 1.8 kHz SSB filter or a SSB wide filter of 3.3 kHz.

Speaking of CW, the IC-703 can operate in either full break-in mode or semi-break-in mode. The semi-break-in seems to work the best for me. All of the preferences for CW are set within the various menus.

The IC-703 is menu-driven and there are lots of menus to set up. One of the menus controls how the radio will operate on battery power. You can also configure the IC-703 so the backlighting can be turned on, off, or in automatic mode. This simple feature can really save your batteries!

Operation out of the box is quite easy, only after a few hours you will begin to configure the IC-703 to suit your own operating style.

There are so many features, it's hard to get into each one. For example, there's a simple band scope that will scan the band looking for stations. It's nice, but it does not exactly excite me.

There's a speech compressor for improved average talk power. Like every processor I've come across, sometimes turning it on works wonders, and sometimes there's not much difference. You can set the amount of compression to suit your voice and band conditions.

Operating the IC-703

Since I already own an IC-706, getting used to the IC-703 was very easy. I enjoy operating CW so I installed the 500 Hz crystal filter. It's not exactly plug-in, you have

to remove the top PC board and solder the filter onto the second PC board. There are quite a few plug-in headers that need to be removed before you can get to the second PC board. It's not for the faint of heart.

On the other hand, it's not as hard to do as it appears. As a matter of fact, I installed the CW filter in my IC-703 in the hotel room during the Hamvention.

Like I said earlier, if you even plan on doing a little bit of CW with this radio, the CW filter is a must. It's an expensive option at about \$165. CW operation works without any problems and the ten watts was more than enough to work just about anything I could hear. SSB operation generated lots of good comments on the audio. I never tried the speech compressor while using SSB. I did work some DX on FM on the 29.6 calling frequency. Again, I received good audio reports while on FM. I have not tried the IC-703 on AM yet, but will give it a try on 7.290 this coming fall.

The receiver seems to hold up just fine on a crowded band, but I don't have the antennas to really bring in lots of extra strong stations. All in all, the receiver works just fine for my operating style.

I would have liked to have seen a few more AGC time selections. You can turn on fast AGC or normal AGC time constants.

The DSP works great! The automatic notch really cleans out the tuner uppers on SSB. The automatic noise reduction works fine, too. In fact it's better than the noise blanker at taking out engine noise. You can select how much noise reduction you want the DSP to work with via one of the menus.

The internal antenna tuner worked correctly with just about any antenna I tried. It does not have the tuning capacity of some of the outboard automatic tuners, so don't expect it to tune your 20-meter dipole for 160-meter use. You can turn off the automatic tuner and run the rig straight through if you like.

The IC-703 comes with power cable, microphone, and instruction booklet.

Nits to pick

With a radio that has so many features, it's hard not to get trapped in the menus. There are so many menus, you can get lost. So unless you play with the radio all the time, you had better keep the manual nearby. For example, the IC-703 contains an automatic serial number generator for CW contests. You have to dig into the manual to figure out how to make it work. It's not intuitive when it comes to the oddball things that this radio is capable of doing.

You can only install one internal filter. That's bad. But on the other hand, at \$160 a pop or so, you could not afford to put in more than one. Unlike my Argonaut V, with its 35 DSP-based filters, the IC-703 is limited to just one crystal filter.

The power connector is attached to the radio via a flying lead about nine inches long. Why? There just had to be room for a power connector on the rear apron of the radio. But guess not. Anyway, the power leads are about nine inches long and terminate into an Icom-style power connector. The other end plugs into this arrangement and then to your power supply. Overall, there's about eight feet of wire to go to the power supply. The Icom IC-703 uses the OPC-1229 power cable.

What's good?

The ability to operate on battery power is an outstanding advantage to most of the other radios out in the market place. Hats off to the designer at Icom for taking this important step. The size of the radio makes for easy operation. Unlike the FT-817 with its super small knobs and tiny display, the IC-703 feels like a grown-up radio. Granted, the FT-817 can be slung over one's shoulder and operated from the internal batteries while the IC-703 cannot. (OK, you can mount the IC-703 into Icom's new LC-156 multi-bag.)

I am out of space this month, so next time we meet, I'll have some more info on the new Icom 703

The NEW second edition of the HW-8 Handbook

The second edition of the *HW-8 Handbook* is now shipping. It's a complete redo of the book. I've included lots more information on the HW-7, HW-8, and the HW-9. There's PC board overlays for all three radios, company service bulletins, and complete alignment instructions. I've kept the most popular modifications and added new ones. There are photographs through the new book as well as "Heathtips" for those little things that make life easier.

The new book is spiralbound so that it lies flat on the workbench and is printed on 80-pound paper. The second edition of the *HW-8 Handbook* should be on everyone's shelf.

You can get your own copy for only \$15 plus \$4 for priority mail shipping. Send a check or money order to the address at the top of the column. I'll pop one in the mail as soon as I get your order.

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AOR Introduces AR-ONE Receiver

AOR USA has announced the availability of the AR-ONE, a new wide-range communications receiver capable of monitoring any frequency from 10 kHz to 3.3 GHz with excellent sensitivity while providing maximum user flexibility. An earlier planned introduction of the AR-ONE was delayed, but AOR reports that units are now flowing into the marketplace.

"The AR-ONE Communications Receiver was designed and built with the monitoring professional in mind," said Takashi "Taka" Nakayama KW6I, Vice President of AOR's North American operations. "It can stand alone as a highly accurate receiver or it can support secondary signal processing, spectrum display units, and computer signal analysis."

The AR-ONE has two RS-232C ports on its rear panel. "This will allow the joining of multiple AR-ONE units. As many as 99 AR-ONE receivers can be controlled by a single computer."

The AR-ONE was conceived as a "breakthrough" design. Its many features include ten VFOs; 1,000 memory channels; an ultrastable frequency reference oscillator; selectable tuning steps and resolution down to one Hertz (Hz); the ability to monitor AM, NFM, WFM, USB, LSB, CW and data modes; a triple-conversion superheterodyne front end; adjustable BFO; high intercept; multi-IF signal output ports at 10.7 MHz or 455 kHz; and more.

Operating features include the ability to control all functions by computer and most functions through the control head. The unit can communicate many settings and readings to the user, including such items as signal bandwidth and the strength of a received signal.

The rear panel has two RS-232C ports, an "N" connector antenna terminal, two BNC inputs, power input, speaker output, and the IF taps.

"The AR-ONE is designed for profes-

sional users, such as governments, military applications, law enforcement, laboratories, and others who require the ultimate in a sensitive, wide-range receiver," said Mr. Nakayama. "At this time, we do not have plans to produce a version of the AR-ONE that has cellular frequencies blocked, so it cannot be offered for sale to the general public in the USA," he said.

With the ability to link up to 99 receivers, the AR-ONE may be an unparalleled resource for surveillance operations and high-end monitoring. The unit can be installed in base or mobile operations.

The user has the flexibility to tune in increments of a single Hz, making most of the widely used available RF spectrum tunable to the AR-ONE. Its ability to readout signal strength in user-selectable dBμV or dBm units makes direction finding more scientific, and its ultrastable frequency reference brings a lab-quality readout to the user in day-to-day operations.

Rear panel IF outputs allow for secondary signal processing and analysis. In addition, other accessories or computer programs make visual signal display possible, including graphic displays.

"The AR-ONE may well redefine what is possible in terms of monitoring," said Mr. Nakayama. "We believe governments need enhanced tools for surveillance to keep pace with communications developments, particularly as applied to Homeland Security. One area of interest is the ongoing battle against terrorism across the world. We hope the AR-ONE can play a role in bringing those efforts to a quicker conclusion."

Specifications

Model: AR-ONE
Configuration: Triple conversion superheterodyne
Frequency coverage: 10 kHz – 3.3 GHz (no gap)
Receive mode: AM, NFM, WFM, USB, LSB, CW, data
Sensitivity (AM mode — 10 dB S/N; NFM mode — 12 dB SINAD; CW/SSB

mode — 10 dB S/N): 10–40 kHz — CW 22.3 μV; 40–100 kHz — AM 4.5 μV, CW 1.5 μV; 100 kHz–2 MHz — AM 2.5 μV; 2–40 MHz — AM 1.5 μV, SSB/CW 0.7 μV, NFM 0.89 μV; 40 MHz–1 GHz — AM 0.89 μV, SSB/CW 0.4 μV, NFM 0.5 μV, WFM 1.5 μV; 1 GHz–2.5 GHz — AM 0.7 μV, SSB/CW 0.32 μV, NFM 0.4 μV, WFM 1.5 μV; 2.5 GHz–3 GHz — AM 0.9 μV, SSB/CW 0.35 μV, NFM 0.5 μV, WFM 1.5 μV

IF frequencies: 1st IF — 754 MHz/265 MHz; 2nd IF — 10.7 MHz; 3rd IF — 455 kHz

Frequency steps: Standard steps — 1, 10, 50, 100, 500 Hz; 1, 5, 6.25, 9, 10, 12.5, 20, 25, 30, 50, 100, 500 kHz. Nonstandard steps: less than 1 MHz (1 Hz incremental)

Selectivity (B/W, –3 dB, –60 dB, in kHz): 0.5, >0.5, <2, 3, >3, <6, 6, >6, <20, 15, >15, <40, 30, >30, <70, 110, >110, <450, 220, >220, <600, 300, >300, <900.

Spurious sensitivity: >60 dB
Adjacent selectivity: >55 dB
Dynamic range: >70 dB
Unwanted spurious emission: <–57 dBm
3rd IP: >+2 dBm

Frequency stability: ±0.1 ppm (–10–50°C)
THD: >20 dB (<10%)

Audio output: 1.5 W (at 8 ohms, THD <10%)

Power requirement: 13.5 V DC, <1 amp (@ 1 W audio output)

Antenna impedance: 50 ohm
Antenna connector: N-type
IF output level: –20 dBm (10.7 MHz)
External frequency standard input: 10 MHz
Control interface: RS-232C

Operating temperature: –10–50 degrees (C), –18–144 degrees (F)

Dimensions: 157 (w) x 58 (h) x 221 (d) (mm), 6.2 (w) x 2.3 (h) x 8.7 (d) (inches) (main unit only, projections excluded)

Weight: Approximately 1.8 kg (4 lbs.), main unit only

(Specifications are subject to change without notice or obligation.)

NEVER SAY DIE

continued from page 9

there have been a few, but by far the most valuable education for me was the Navy's nine-month electronics course. And it was fun, too. I loved it!

Other courses that stand out in my memory were those in reading music and art appreciation at the Longfellow School in Pennsauken, NJ, in the second and third grades, and the art course at Erasmus High School in Brooklyn, NY. It was that same course, taught by the

same teacher (Mr. Dockett), that got my mother interested in being an artist, going on to Pratt Art Institute and a career in commercial art.

You know, I'd like to see teachers start

Continued on page 62

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the November issue, we should receive it by August 31. Provide a clear, concise summary of the essential details about your Calendar Event.

AUG 2

ALFARATA, PA Juniata Valley ARC Hamfest, 6:30 a.m. General admission, 8:00 a.m. Morning and noon food items available. Admission \$2.00 donation, XYL and children free. Tailgating \$5.00 donation, includes admission. Indoor tables, \$10.00 donation per table. Space is limited. Vendors responsible to collect PA sales tax. Electricity, \$2.00 additional. Please bring your own power cords. Directions: The Decatur Fire Co. is located along US Route 522 North, 8 miles east of Lewistown, PA in the town of Alfarata, PA. Look for signs. Talk-in on 146.910 MHz. *For more info, contact JVARC, PO Box 73 Yeagertown PA 17099, or contact Cliff Bell WB3IVX, 717-248-2616.*

AUG 10

GREENTOWN, IN The Greentown Hamfest Committee will hold their 6th Annual Greentown Hamfest Sunday, August 10th, 7:30 a.m. to 1 p.m. at the Greentown, Indiana Lions Club Fairgrounds. Talk-in on 147.24 and 146.79. Vendors preregister by sending a form or E-mail to [k9nqw@arrl.net]. Check the Web site at [www.grantarc.com/greentown.html]. Handicap parking will be available. Anyone who obtains a license or upgrade at our VE exams session will be admitted free. Tickets are \$4 in advance and \$5 at the door. 17-years-old and under free. Vendor setup is on Saturday at 6 p.m. to 8 p.m., and on Sunday 5:30 a.m. to 7:30 a.m. Inside tables \$8 plus ticket; tailgate setup \$3 plus ticket. Make checks payable to *Greentown Hamfest*. Contact *Greentown Hamfest*, c/o L.B. Nickerson K9NQW, 517 N. Hendricks Ave., Marion IN 46952. Phone 765-668-4814.

PEOTONE, IL The Hamfesters Radio Club is proud to announce that they will hold their 69th Annual Hamfest Sunday, August 10th, at the Will County Fairgrounds (I-57 Exit 327 East) in Peotone. The air-conditioned, fully enclosed pavilion ensures you a good spot, rain or shine, hot or not. This hamfest is vendor friendly. Saturday setup from 3 to 11 p.m. (August 9th). Convenient unloading and parking areas. Free overnight parking. A secured building. The fairground offers plenty of free parking and there are ample food and rest room facilities. Tables are \$15 each, electric \$10. One ticket free per vender. All others \$5 in advance, \$6 at the gate. Your gate pass will be issued at arrival, your ticket will be needed. Gate opens

at 6 a.m. Sunday. Main Exhibition Hall opens at 8 a.m. sharp. Send reservations and donations to *Robert Nelson WB9WFR*, 1720 Vollmer Rd., Flossmoor IL 60422. VE exams will be available. Visit the Web site at [www.hamfesters.org] for more info.

AUG 16

CHANUTE, KS The Chanute Area Amateur Radio Club Hamfest will be held on August 16th at Zion Lutheran Activity Center, 1202 West Main. Admission \$2. Talk-in on 146.745 (tone 100) rpt. Contact *Keith Rather 620-431-0930*; or *Charlie Ward 620-431-6402*.

OAKLAND, NJ The Ramapo Mountain ARC will hold its 27th Annual Ham Radio and Computer Flea Market on Saturday, August 16th at the American Legion Hall, 65 Oak St., Oakland NJ. This event is ARRL sanctioned. Vendors setup at 6 a.m., buyers admitted 8 a.m. until Noon. The kitchen opens at 7 a.m. Talk-in on 147.49/146.49 and 146.52 simplex. Donations \$5 with XYL and harmonics admitted free. Inside tables \$12 each. Tailgate spaces \$10 each. For more info please contact *Bob Anderson K2BJG*, 69 Page Dr., Oakland NJ 07436. Phone 201-337-6945; fax 973-962-6210. Club E-mail [rmarc@qsl.net]. Club Web site [www.qsl.net/rmarc].

SPANAWAY, WA The Radio Club of Tacoma (W7DK), will hold their 2003 Hamfest at Bethel Junior High School in Spanaway, 9 a.m. to 3 p.m. Directions: From I-5, exit 127 to SR-512 E; go about 2 miles to Parkland Exit. Turn right, go about 8 miles to 224th St. Turn left. Go 1 mile to 38th Ave. East; turn left. About 0.3 mile, signs on right. Talk-in on 147.38 PL 103.5, or simplex 147.500. Visit [www.w7dk.org]. for more info, or contact *Frank or Jill Palmer*, 253-539-7772. E-mail [ac7jy@msn.com]. Setup Friday 2 p.m. to 7:30 p.m. and Saturday 6 a.m. to 8:30 a.m. Admission is \$5 with 16-year-olds and under free if accompanied by an adult. Plenty of free parking. RV parking available for self contained units only. VE exams will be held at 10 a.m.; contact *Shirley Murphy N7QHW*, [sundancealso@harbornet.com]. Tables available on site. Non-commercial tables \$20 each, includes one admission. Commercial tables \$30 each, includes one admission; helpers \$5 each (limited).

AUG 22, 23

ALBUQUERQUE, NM The 2003 Duke City

Hamfest will be held August 22-23 at the University of New Mexico Continuing Education Conference Center, 1634 University Blvd., NE, in Albuquerque. Talk-in on 145.33(-) (100 Hz) and 444.00(+) (100 Hz). RV parking (\$10, dry camping only, no hookups). Tables \$12 with no power and \$18 with power. Doors open Friday 5 p.m. to 9 p.m., Saturday 7 a.m. to 3 p.m. Flea market, free tailgates, VE exams, forums. Free admission. Contact *Richie Allen KC5NZR*, 1624 Columbia Dr. SE, Albuquerque NM 87106. Phone 505-242-0208, or E-mail [kc5nzs@arrl.net]. You can find more info on the Web site at [www.qsl.net/dchf].

AUG 23

ST. CLOUD, MN The 57th St. Cloud ARC Hamfest will be held at the St. Cloud Armory on 8th St. North and 16th Ave., on August 23rd. Setup starts at 8 a.m. Doors open to the public 9 a.m. to 2 p.m. Talk-in is on 147.015 MHz; gabbing on 146.940 MHz. VE exams on site at 12 noon. Contact *Jack Maus W0MBD*, 12647-210 St., Cold Spring MN 56320. Phone 320-685-8295, or call the radio club at 320-255-1410.

AUG 30

UNIONTOWN, PA The Uniontown ARC will hold its 54th annual Gabfest on Saturday, August 30th at the club grounds located on Old Pittsburgh Rd. in Uniontown PA, just north of the intersection of US Rt. 119 and PA Rt. 51. Starts at 8 a.m. Free parking and free tailgating with registration. Talk-in on 147.045(+). Tables available. For info call Carl WA3HQK, or Joyce KA3CUT at 304-594-3779.

SEP 12, 13

BENTONVILLE, AR The B.C.R.O. Hamfest will be held at Thomas Jefferson School, 810 Bella Vista Rd., Bentonville AR, Saturday 8 a.m. to 1 p.m. Setup is Friday night at 6 p.m. VE exams at 10 a.m. Saturday. Talk-in on 145.290 down 600. Admission \$3. Tables \$5. Tickets are two for \$5. Food and drinks available. Contact *Betty Weilberg* at 417-435-2332 or by E-mail at [jweiberg@leru.net]; call *Shirley Harris* at 479-451-8626; E-mail [saharris@centurytel.net]; or *Buster Morrow* at 479-631-9231. E-mail [ad5am@mc2k.com].

SEP 14

NEWTOWN, CT The Candlewood ARA of
73 *Amateur Radio Today* • August 2003 39

Danbury CT will hold their Western CT Hamfest on Sunday, September 14th, at Edmond Town Hall. Directions: Rte. 6. Exit 10 off I-84. Follow the signs. Talk-in on 147.300(+) PL 100. New equipment dealers, flea market, tailgating, electronics, computers, refreshments. Tables \$12.50 each (includes 1 admission). Tailgating \$8 (includes 1 admission). Admission \$5, children under 12-years-old admitted free. For reservations and info, contact John M. Ahle W1JMA, 120 Fire Hill Rd., Ridgefield CT 06877. Call 203-438-6782; or E-mail to [W1JMA@arrl.net].

SOUTH DARTMOUTH, MA The Southeastern Massachusetts ARA, Inc. will hold its annual flea market on the club's grounds at 54 Donald Street in South Dartmouth. The event will run from 7 a.m. to 12 noon, rain or shine. Talk-in on 147.00/60. Admission \$2 (spouse and children free). Walk-in VE exams at 10 a.m. Free space and admission for vendors. For more info go to [www.semara.org], or contact Tim Smith N1T1 at 508-758-3680. E-mail to [rt_smith@yahoo.com].

SEP 20

ROLLING MEADOWS, IL The 51st Annual W9DXCC Convention and Banquet will be held Saturday, September 20th at the Holiday Inn (near O'Hare Airport) in Rolling Meadows IL. Come early. There will be a Friday Welcome Reception hosted by Carl Smith N4AA and DX Publications, followed by a Hospitality Suite late Friday. This will be hosted by the Northern Illinois DX Assn. Stay late on Saturday night and enjoy the Saturday Night Hospitality Suite hosted by the Greater Milwaukee DX Assn. Other features will include presentations by major DXpeditions, an ARRL forum, Grand Banquet and prizes, and DXCC QSL card checking. The Master of Ceremonies will be Jim O'Connell W9WU. For more info contact Bill Smith W9VA by calling 847-945-1564; or E-mail to [w9va@aol.com].

SEP 25-28

SEATTLE WA Microwave Update 2003 organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25-28, 2003. Registrations for the joint conference will be accepted beginning April 1st. Cost of the registration will be \$40 prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be \$50. Registration forms can be downloaded at [www.microwaveupdate.org] or send an SASE to John Price N7MWV, 12026 81st Ave. NE, Kirkland WA 98034, and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to Microwave Update 2003. Joint conference sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are \$69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at 425-337-2900. Be sure to mention "Microwave Update" to get this rate. Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to Jim Christiansen K7ND, via E-mail at [k7nd@att.net]. MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to NU7Z [nu7z@aol.com]. For presentations at the Pacific Northwest VHF Conference sessions, contact N7CFO at [n7cfo@ix.netcom.com]. LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice.

SPECIAL EVENTS, ETC.

AUG 16, 17, 18

NEW JERSEY QSO PARTY The Englewood Amateur Radio Assn., Inc. invites all amateurs the world over to take part in the 44th Annual

New Jersey QSO Party. (1) The time of the contest is from 2000 UTC Saturday, August 16th to 0700 UTC Sunday, August 17th and from 1300 UTC Sunday, August 17th to 0200 UTC Monday August 18th. (2) Phone and CW are considered the same contest. A station may be contacted once on each band — phone and CW are considered separate bands. CW contacts may not be made in phone band segments. NJ stations may work other NJ stations. (3) General call is "CQ New Jersey" or "CQ NJ". New Jersey stations are requested to identify themselves by signing "De NJ" on CW and "New Jersey calling" on phone. Suggested frequencies are 1810, 3535, 3950, 7035, 7235, 14035, 14285, 21100, 21355, 28100, 287400, 50-50.5, and 144-146. Suggest phone activity on the even hours with 15/10 meters on the odd hours (1500 to 2100 UTC); 160 meters at 0500 UTC. (4) Exchange consists of QSO number and QTH (state/province or country). NJ stations will send county for their QTH. (5) Scoring: Out-of-state stations multiply number of complete contacts with NJ stations times 3 points per QSO times the number of NJ counties worked (maximum of 21). NJ stations multiply number of complete contacts times 3 points per QSO times the multiplier. The multiplier is the sum of the number of states (other than NJ), Canadian provinces, and NJ counties worked. Maximum is $49 + 13 + 21 = 83$. (6) Certificates will be awarded to the first place station in each NJ county, state, province, and country. In addition, a second place certificate will be awarded when four or more logs are received. A total of two plaques have been donated by the ARRL Section Managers for NNJ and SNJ to the highest scoring single operator station residing in each of their sections. (7) Logs must also show the UTC date and time, QSO exchange, band, and emission, and be received no later than September 13th, 2003. The first contact for each claimed multiplier must be indicated and numbered and a check list of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to Englewood Amateur Radio Assn., Inc., P.O. Box 528, Englewood NJ 07631-0528. A #10 size SASE should be included for results. (8) Stations planning active participation in New Jersey are requested to advise EARA by August 1st of your intentions so that they may plan for full coverage from all counties. Portable and mobile operation is encouraged.

SEP 27

RAYMOND, ME The U.S. Coast Guard Auxiliary D1NR Radio Raymond, K1G. 1300Z-2100Z Sep. 27th. 64th USCG Auxiliary, 25th Canadian CG Auxiliary anniversaries and ISAR Special Event Radio Day (VO1RAC). 28.320, 21.310, 14.260, 7.260. CGA Certificate. Contact Keith C. Morton W1NDH, P.O. Box 809, Raymond ME 04071-0809.

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Construction of a 47 GHz Transceiver and Other Junk Box Considerations

Well, here we are, and I never thought I would be talking about working at 47 GHz using some sophisticated junk box parts. However, surplus material is being made available and with a diligent search of surplus outlets you can also obtain components that can be assembled into an effort making construction possible.

It was not an overnight collection binge that put this effort forward, but rather a slow process aimed in this direction. Collecting material for a planned project does take time, especially when you are not ready to sell the family farm for parts needed. Some of the material can be obtained in nearly ready made kits with only one problem — they are costly.

I chose another avenue and that was to sit and wait like a spider in a net for the parts to come my way. Whatever method for collection, time is on your side. If you will allow time to collect surplus bargains you too can put an inexpensive transceiver converter together. All you need is some luck to locate key parts and the time to find

the inexpensive components needed. Take, for example, my first SSB transceiver for 10 GHz.

In construction of the SSB rig, I should have revamped circuitry to make it more reliable by manufacturing PC boards used for control and switching; instead of the dead bug-type construction I used back some 10 years ago. Even so, this rig has stood the test of time.

For example, when I mounted the 10 GHz rig in my grandson's tree fort in the back yard, the kids filled my outdoor compartment with about 25 pounds of sand. Needless to say, some shaking out was needed and I thought it was a goner. Took a while to dump all the sand and vacuum it out but

it's still working just fine now — with a lock on the transit case.

This little episode demonstrated certain reliability in construction even back then in my early years of putting surplus parts together. I still can imagine the effort it took to haul all that sand up into the tree fort and dump it carefully into the muffin fan exhaust hole. There still is sand embedded in the RTV used to harden the circuit boards. Using the RTV like a potting compound to protect the wiring and parts has worked well over time.

The rig is switched by 4 SMA relays controlling a TWT (Traveling Wave Tube) 10 watt amplifier and a series of 2 RF preamps. The unit was a collection of quite

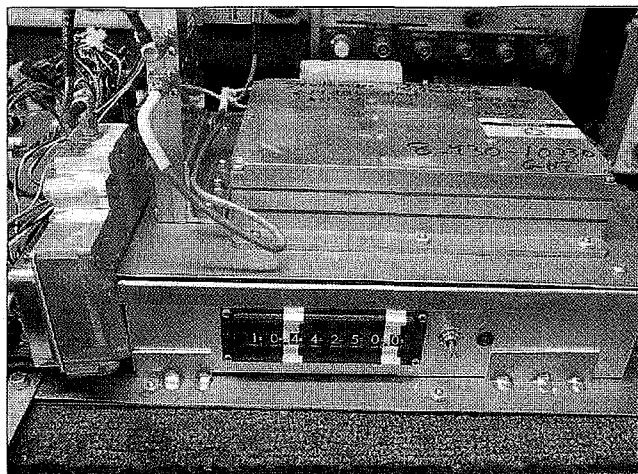


Photo A. Front view of synth top right, sitting on top of BCD controller chassis. Synth capable of operation from 8930 to 10730 MHz with +14 dBm output. Frequency steps as fine as 1 kHz throughout its frequency range set by BCD switches on control panel. Close in phase noise better than -90 dB.

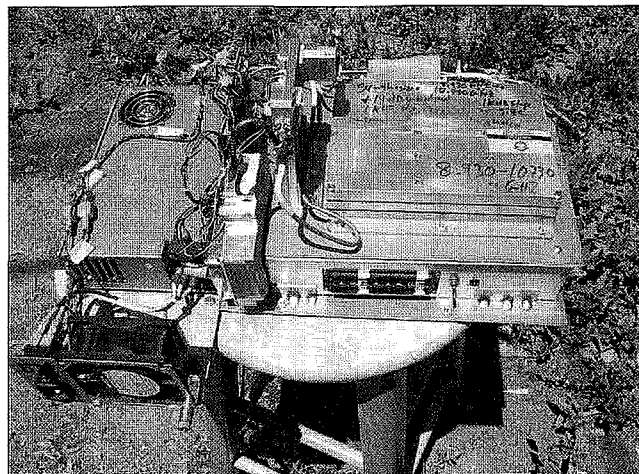


Photo B. Top view of total system main synth to right, 2640 MHz synth bottom left in aluminum cutout shield compartment. Pecom TX module just above 2640 MHz synth. Switching regulated power supply to far left with cooling fan in front of power supply.

a bit of equipment all assembled over time, and is still running just fine, knock on wood. On the other hand, the setup of establishing a station on 24 GHz was easy, as my confidence and shaky hand and eyesight were not that of my younger years, and I put that project off till a completed transceiver made its way into my hands.

In other words, I paid my way into this rig for 24 GHz. It was a Pecom transceiver modified by Sam Lutweiler K6VLM of the San Bernardino Microwave Society (SBMS).

Large quantities of these transceivers were obtained in a group bulk purchase of these surplus Pecom transceivers. The types we obtained were what we call high-side injection and low-side injection. The low-side injection had a frequency of operation of 23.xxx GHz for transmit and received in the 22 GHz range. For high-side injection the TX and RX frequencies are just reversed to make a full duplex pair.

Of primary interest was the construction of a 24 GHz rig from Pecom Surplus. Sam K6VLM, who became a silent key, accomplished this effort with great results. In the meantime, Kerry N6IZW also was working out the conversion of the Pecom modules for a 24 GHz transceiver from his original tests and some of Sam's notes. Lots of other ideas have sprouted for these modules and are being worked on by many other individuals. This project is still ongoing.

Kerry N6IZW, who has modified several modules, observed the relationship of the frequencies used in the unmodified 23 GHz transmit module. While in its original configuration — it was driven by a 9 GHz LO and had an IF frequency of nearly 3 GHz

— it presented some interesting possibilities for use on 47 GHz. With a 10 GHz LO drive which is doubled in the Pecom TX module mixer, and IF drive in the 2.640 GHz produces a RF output in the 23.5 GHz range. This method allows the Pecom TX module to operate nearly stock, driving a final output mixer doubling the drive ($23.525 \text{ GHz} \times 2 = 47.05 \text{ GHz}$).

A little figuring revealed that by using components on hand, the following could be constructed and given a try. Working backwards, if we used 47.05 GHz for an LO divided by 2 = 23.525 GHz (the Pecom TX unit driver output). Now we had 2.640 GHz synths on hand and used one for the IF input driver on the Pecom TX converter. That meant that 23.525 GHz the TX output minus $2.640 \text{ GHz} = 20.885 \text{ GHz}$, which is the twice the input drive LO to the TX module. Dividing that by 2 = 10.44250 GHz.

Now for other than power supplies, dish antenna, synthesizer, or source of a local oscillator and a mixer for 47 GHz, this rig could be constructed with the major item being the TX module from the 23 GHz Pecom transmitter. These Pecom units have been made available for about \$20 to \$50, depending who has them and their condition.

Using an agile synthesizer that can be set up in 1 kHz steps made the main LO task simple. A Frequency West brick or other LO could be used here. We used the Agile Synthesizer as it was in our junk box and it operated from 8930 MHz to 10700 MHz — just right for the required 1044250 MHz LO drive. Using with the Qualcomm 2640 MHz synthesizer (Pecom IF in/out) gave an output at 23.525 GHz, right in the normal

operation range of the TX module. With 100 mW (+20 dBm) drive (Pecom output) at 23.525 GHz to inject into the LO port of a home-built mixer constructed from 2 anti-parallel diodes (LO doubler), we got 47.05 GHz, 50 MHz up from the bottom of the band.

Using a 145 MHz multimode transceiver as the IF RX/TX source produced an operational frequency of 47.195 GHz. The 2-meter transceiver was set to 250 mW output, 1/4 of a watt. An 8 dB attenuator was attached between the transceiver and the microwave mixer. This reduced the transmit power to +7 dBm output drive to the IF mixer port. Total mixer power being used was the LO at +20 dBm: IF drive on transmit of +7 dBm seemed a little high but we went for the gusto and it seemed on test to function very well. Besides, we had replacement diodes in the way of PC boards from Qualcomm Surplus to obtain new mixer diodes should that be needed.

A trial at Kerry N6IZW's QTH during the San Diego Microwave Group's monthly meeting was our show-and-tell portion of the system check. It was a go for the gold effort without system checkout.

First test on the workbench at 2 feet showed initially something was very wrong — we were receiving signals every 25 kHz up and down the band. Checking with the spectrum analyzer, it was traced to my 2 GHz synthesizer DC power supply 10-volt line. It seems that the 7812 12-volt voltage regulator was oscillating and needed better filter cap action. Replacing the 10 μF bypass cap with a 100 μF cap removed the offending ripple on the DC feed and cleaned up the synthesizer output greatly. Testing the transverter over this 3 foot path proved simple and produced a great note for CW near as good as you could get. For a simple test we tried SSB on Kerry's 2-meter multimode IF driver. I switched to SSB on my Yaesu FT-817 and clarity was just as good as 40 meters during the best of times.

Wow! This was a contact on 47 GHz and what fun this was! It was like putting your first crystal detector set together. Just for additional fun we decided to increase distance as we were using AC power supplies for the rigs. We patched in a seventy-five foot extension cord and walked out of the garage and down the driveway, still operating SSB between Kerry N6IZW and myself, WB6IGP.

What fun. Signal levels were in the S8+ region still. Moving the 10 GHz synthesizer 10 kHz in frequency (it's multiplied by 4 in the rig) moved the IF frequency 40 kHz as expected. Also trying later that evening

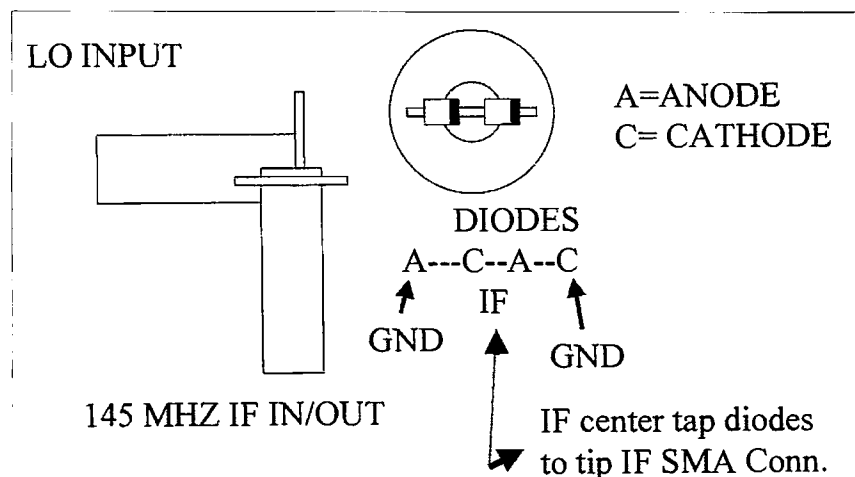


Fig. 1. Showing mixer construction/placement of microwave diodes on back of SMA bulkhead connector. Use shortest possible lengths. Used bare mixer for demo on 47 GHz for short SSB contact at club meeting SDMG San Diego Microwave Group.

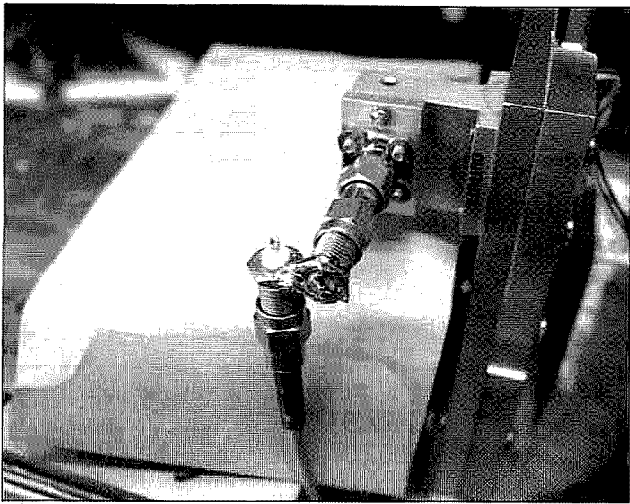


Photo C. Close-in shot of system mixer showing fly spec diodes and IF cable (145 MHz) and SMA connector pointing downward in this test configuration.

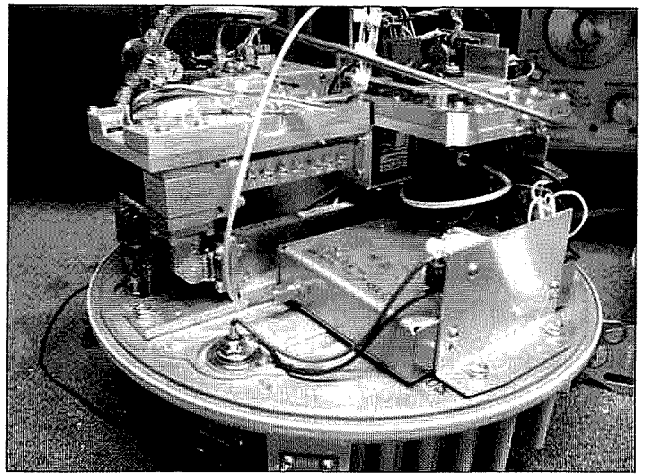


Photo D. Side view of complete modified Pecom 24 GHz rig completed by Sam K6VLM. Center is same TX module used in 47 GHz rig. Module behind TX unit on multi screw aligned filter is receiver module.

after Kerry placed a 40 GHz waveguide in the system to ensure it was not 23 GHz overload of the receive mixer and signals were still functional, proving to our satisfaction we really were on 47 GHz. After all, we had to use these procedures as we did not have 47 GHz test equipment, and an alternate method had to be used to demonstrate what was going on.

Now several things we used to assemble this surplus material making this transceiver possible. It took time and effort but was assembled all in surplus and is a demonstration to show others a possible road to follow.

There remain several issues, those being small dish antennas to be added to the system allowing greater operating range. DC power supplies make the rigs portable. The AC switching power supplies were used initially because they supplied plus five, in addition to plus 15 volts that were adjusted to 5.2 volts and 15.6 volts on the +15 volt supply for the YIG synthesizer requirements.

A bank of voltage regulators for minus 5 volts, and plus 10 and 12 volts DC for other circuit requirements, came off of the switching power supplies' plus and minus 15 volt output taps. A little crazy to use a switching power supply capable of 40 amps at 5 volts, but robust for our power needs and it was in the junk box.

This multi voltage output power supply made the power supply issue only a matter of connectors and a slight voltage re-adjustment to increase the 5 and 15 volt lines up a few tenths of a volt for synthesizer requirements. Other changes might be to remove the synthesizer control BCD switch box and

hardwire the YIG synthesizer control circuitry and greatly reduce the size of the rig. Lots of possibilities. After all, there are still new junk boxes to look in and we just might find what we are looking for if we sit back and wait for that item to land in our spider's web.

The power supply, like most other items, was obtained in surplus from a local scrap metal junkyard. The Pecom transceiver was obtained surplus for \$20 from another scrap metal yard in the Sunnyvale CA area. The synthesizer was obtained in surplus, a find I am still amazed about; I feel very lucky we were able to obtain it for our microwave group. It was a chance thing alerting me to the frequency agile synthesizer, and we jumped on them like an ant into a jar of honey. Like all items rare, it was one of several key items used in the construction of the converter for 47 GHz.

In the picture is the synthesizer sitting on top of the BCD switch controller for the parallel input control to the synthesizer programming data lines. Inside the controller is an external 10 MHz OCXO reference oscillator. Just by the muffin fan on the bottom left is the Qualcomm DRO synthesizer set to a fixed 2640 MHz. The module standing on edge is the Pecom TX transverter to 23 GHz. The part of this system that is home-built is the 47 GHz mixer.

The mixer consists of two SMA bulkhead coax connectors, one modified to accept two microwave diodes on its back face and the other to serve as 145 MHz IF port. The diodes used were scrap from Qualcomm transceivers for 14 GHz obtained locally. Application of a heat gun removed the diodes from the original PC board, a 14 GHz mixer.

Their quality seems unsurpassed and they showed great millimeter frequency applications — especially considering the cost. Like all of the other material we picked up for this project, the diodes for the mixer also proved to be surplus material. I have to admit that I purchased new the two SMA connectors used for the mixer.

Mixer modification

The bulkhead SMA connector Teflon is cut off flush with the back of the SMA flange. Also, the center conductor of the SMA connector is cut off nearly flush with the back of the connector. Next, a second SMA connector is soldered to the first connector to make the structure rigid. Use 0.141 hard-line to support both connectors and form the mixer towards the focus point of a small dish. The mixer is not difficult to construct.

Two diodes are required. One diode is soldered one end to ground and the other end to the nub of the center conductor of the SMA connector centered about a straight line from 9 o'clock to the center pin (anode to ground, cathode to the center pin). The second diode is soldered anode to center pin in line from center pin to 3 o'clock and cathode grounded. Leads are kept as short as possible with the diode laying flat against the flange back of the SMA connector.

Testing to see if the diodes survived the handling and soldering, measure with a VOM on diode check or use the x10 scale of a VOM. Measure from center pin to ground and you should see a diode junction forward resistance. Reverse the meter

Continued on page 59

Inventory Time

As with those who monitor the stock market, it's time to take stock of our hamsat assets.

We have lost some valuable resources in 2003. A number of amateur satellites have gone silent, the digital hamsat population is at a low not seen in over a decade, and the ranks of the analog voice satellites have been diminished. It's time to get back to our "core business," chasing satellites while we have them.

Too many hams are surfing the Internet or turning into couch potatoes, watching the hundreds of available TV channels offered by cable, and other providers, like DirecTV and the Dish Network. The utility of cell phones has logically eclipsed repeater systems with phone patches, but amateur radio satellites remain as a viable communications medium for those who prefer personal, direct communications, with a touch of homegrown high tech.

What's up?

Did you know that OSCAR-3 is still in orbit? That's right. Unlike OSCAR-1 and OSCAR-2, which were placed in very low orbits back in the early 1960s with their military primary payloads, OSCAR-3 has one of those extremely long-life orbits that will outlast us all. The bad news is that OSCAR-3 can never come back on-line for ham use. It is history. It's gone. It's a silent piece of space junk in the sky.

In 2003, other hamsats have joined it. Fuji-OSCAR-20 and Fuji-OSCAR-29 have become erratic. It's news just to hear that either has been heard on a random orbit. AMRAD-OSCAR-27 has had problems that sound like the end is near. KITSAT-OSCAR-25 is presumed dead and UoSAT-OSCAR-22 may only come back for short periods. They are no longer providing reliable digital service.

Tough times. Is there any light at the end of the orbit? Yes, but this is a job for optimists. The pessimists have already bailed out.

The voice and CW hamsats

The most popular satellites today are the single-channel, cross-band, FM hamsats. All of them use a Mode "J" configuration — two meters up and 70-cm down. UoSAT-OSCAR-14 (UO-14) is the favorite. When the 9600-baud digital store-and-forward system failed a few years ago, this long-life offering from the folks at the University of Surrey in England was retired to a less demanding activity as a simple FM-voice repeater in the ham bands. It is always active and can be worked with a dual-band HT using only a whip antenna. Hand-held dual-band yagis have provided solid contacts for users in remote locations from the back-country of Alaska to cruise ships. Contacts are usually very short due to the large numbers of users on any given pass.

Other FM satellites include AMRAD-OSCAR-27 (AO-27) and SaudiSat-OSCAR-50 (SO-50). AO-27 has been available in North America for FM voice use on occasional weekend morning passes, but SO-50 has been active whenever a control station has been available to turn the satellite on. SaudiSat-OSCAR-41 is also capable of use as an FM repeater, but has not been heard since SO-50 was launched. Both AO-27 and the SaudiSats are more difficult to use than UO-14. They are best worked from home stations with yagi antennas.

Although it's not a ham-radio satellite, the International Space Station finds its place in the FM resource list. Even with limited operations onboard the ISS, the possibility of some voice ham activity from the two-man crew for random contacts exists. Scheduled QSOs with schools continue, thus keeping hams optimistic that a good voice contact might happen.

The most exciting voice satellite has been AMSAT-OSCAR-40 (AO-40). Although there are a number of systems that no longer function since the onboard "event" (explosion?)

shortly after launch, it has provided global communications and extraordinary DX opportunities using relatively small ground-based antenna systems. The transponder incorporates a 23-cm and 70-cm uplink that converts to a downlink on 13 cm. FM is not supported, so SSB or CW must be used for communications.

The orbit is highly elliptical and the pass-band is wide, supporting many simultaneous contacts. It's like having a new ham band available for use almost every time the satellite comes above the horizon. Working 100 countries via AO-40 isn't easy, but it has been done several times. Many DXpeditions have taken equipment along just to make contacts via AO-40. Inexpensive 13-cm antennas and downconverters have made the microwave downlink accessible to anyone with even a small budget for satellite operations.

For the "techies," AO-40 also offers a 24 GHz downlink. Very few stations have successfully received signals from this transmitter, but it is a challenge worth pursuing. Some receivers and transmitters on AO-40 may still be usable beyond those mentioned, but it is highly unlikely that we will ever hear anything on two meters or 70 cm.

All of the other active analog satellites are having problems. The high-orbit AMSAT-OSCAR-10 (AO-10) has been locked into Mode "B" (70-cm up and two meters down) for many years since radiation damage took out the onboard computer system. There have been no reports of usable signals via this satellite since last year.

The Japanese hamsats, Fuji-OSCAR-20 and Fuji-OSCAR-29 are now rarely heard. The batteries on both satellites are failing and ground stations are having difficulty keeping either bird on the air. The Russian RS-15 is very difficult to work, even when it's active. The best low-earth-orbit analog

(non-FM) satellite in the sky is currently AMSAT-OSCAR-7 (AO-7)! After almost two decades of silence this satellite came back to life in late June, 2002. The batteries are dead, but whenever AO-7 enters sunlight, the circuits come alive thanks to power directly from the solar panels. The satellite has two transponders, Mode "A" (two meters up and 10 meters down) and Mode "B". Operators have to be ready for both, since either might be turned on randomly when AO-7 wakes up in the sun. Although the satellite will respond to ground commands, it is easier to just let AO-7 carry on "as is."

Digital satellites

Once we had three reliable 9600-baud digisats, including UoSAT-OSCAR-22 (UO-22), KITSAT-OSCAR-23 (KO-23) and KITSAT-OSCAR-25 (KO-25). Now we have none. UO-22 recently developed battery problems that have precluded reliable operation, while both KITSATs failed some time ago.

It is actually easier to list the few functional digital hamsats than to enumerate the ones that have recently gone off-line. Two popular digital systems are those on the ISS using standard AX.25 packet with the callsign RS0ISS-1, and Nav-OSCAR-44 (NO-44) — otherwise known as PCSat. The ISS packet system may have problems, since it has not been heard for some time.

PCSat was built by midshipmen from the U.S. Naval Academy in Maryland and is primarily a 1200-baud APRS (Automatic Packet Reporting System) digipeater. Even though there are serious problems with the power system, Bob Bruninga WB4APR, has coaxed the satellite along far past its anticipated life.

An overlooked current digisat is MO-46, known as Tiungsat-1 from Malaysia. It offers FM and FSK (Frequency Shift Keying) amateur communications at 38,400 baud. Few stations have made the leap to the higher-speed data rate. This speed may just be the beginning though, since megabit rates are in the works for future digisats.

AO-40 also has digital equipment onboard. In addition to the telemetry downlink, there is RUDAK. RUDAK stands for Regenerativer Umsetzer für Digitale Amateur-Kommunikation (Regenerating Transponder for Digital Amateur Communications). But as implemented in AO-40 it is much more than a regenerating repeater. It is a pair of fully programmable computers, each of which has its own error corrected memory and associated hardware modems and DSP modems. It also controls many of the experiments on AO-40, including the GPS, the SCOPE cameras, two sets of temperature telemetry nodes, the MONITOR HF passive sounding experiment, and the CEDEX radiation experiment.

Looking toward the future

Even with all of the recent losses, we still have many operational hamsats in orbit. If you want to gear up for them all, it would be a full-time job. Unlike AO-7, most satellites never come back after going silent. Batteries are the most common culprit, but other failures can also occur. Go to the AMSAT Web site [<http://www.amsat.org>] and check out the frequencies, statistics, and schedules for the satellites we have today, and use them.

For the future we have Project Echo from AMSAT-NA (North America), Phase 3E from AMSAT-DL (Germany), PCSat-2 from the Naval Academy, and many other small satellite experiments thanks to various universities around the world. There are also occasional surprises like the SaudiSats, the return of AO-7, and satellite projects that seem to happen "under the radar." VUSAT from India could be one, while other projects in France, Russia, and additional countries could show up when least expected. Stay tuned and keep your eyes on the sky.

73

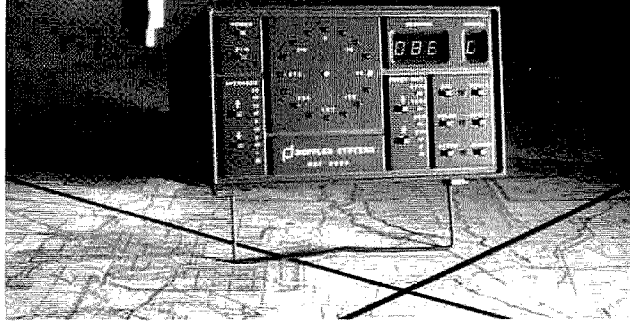
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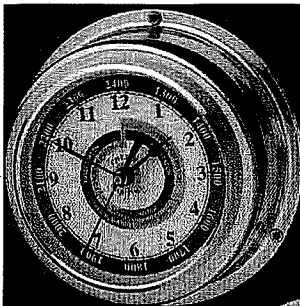
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Mounting an Iron Horse

Does the XYL roll her eyes when she sees your car? If not, you obviously don't have enough antennas! Here's the latest on the KE8YN/7 mobile antenna farm.

For those who might not have seen the last column or two, I recently installed an Alinco DX-70T radio in my vintage Ford Taurus. I had been operating 2 meters with APRS and 440 MHz, but I missed having the ability to work outside the coverage of the local repeaters. In Wyoming there is good repeater coverage, but there are also a lot of wide open spaces, so it seems a natural place to concentrate on the high frequency bands.

Initially I used a trunk lip-mounted multi-band antenna, but I wanted to get better performance, and that naturally called for a larger antenna. I settled on the Iron Horse HF antenna line, and decided to concentrate on 6, 10, 20, and 75 meters. Six meters is kind of a bonus on the DX-70, since it really is a VHF frequency and there is a

separate antenna connection for a six-meter antenna. If you use a multiband antenna you can use a duplexer to separate the coax into two separate connections, but by using the individual antennas for each band, this was not an issue. Whatever direction I took to mount my antenna I would need to do twice — once for the lower bands and a second time for six meters.

The six-meter antenna is shorter than the others, measuring about 50 inches tall. I briefly played with the idea of mounting it with a magnet mount. The Taurus has many parts made of alloys and/or plastics, including the trunk lid. As such, the only viable place for the antenna would be on the roof. I could see a tree limb or Wyoming's famous wind knocking the antenna off the roof very quickly, so I decided against that option.

I crawled under the rear of the car several times trying to come up with a suitable idea. The rear bumper is plastic. I assume there is some metal located inside the plastic bumper shell, but without disassembling it I never found where that metal might be. I do know after lying on the ground under the car that the backside (well, the part closest to the front of the car but hidden from view) has blocks of Styrofoam inside the plastic shell. In any case, the bumper offered no opportunity that I could see.

I looked through the various radio catalogs and on-line for a suitable antenna mount, without any luck. In my effort to pursue every route of research, I made a trip to the nearest truck stop and looked through the CB radio selection. I figured that most trucks have a significant amount of fiberglass to save on weight, so truckers would have similar issues. Nothing appeared to be a perfect solution. Most truck antenna mounts are designed to attach to the rear-view mirror mount, so most were designed to clamp to a tubular structure.

One possibility had the 3/8-inch 24 mount attached to a 6-inch piece of 1/4-inch aluminum bar stock. There was a mounting bolt through a 3/8-inch hole at the other end of the aluminum bar. The Taurus has two steel fixtures at the rear of the body that are designed to accept the tire jack for a roadside tire change. Although I really didn't want to obstruct the jack mount, I thought of several things. First, in the event of a flat tire, I expect to call the auto club — and they use a real jack rather than the one stowed in the trunk. Second, I have no desire to ride around on the undersize mini-spare that is in my trunk. Third, communications are more important to me than a "Plan B" for a flat tire.

I crawled under the car with the antenna mount — and naturally it was far too short. However the basic concept looked like it

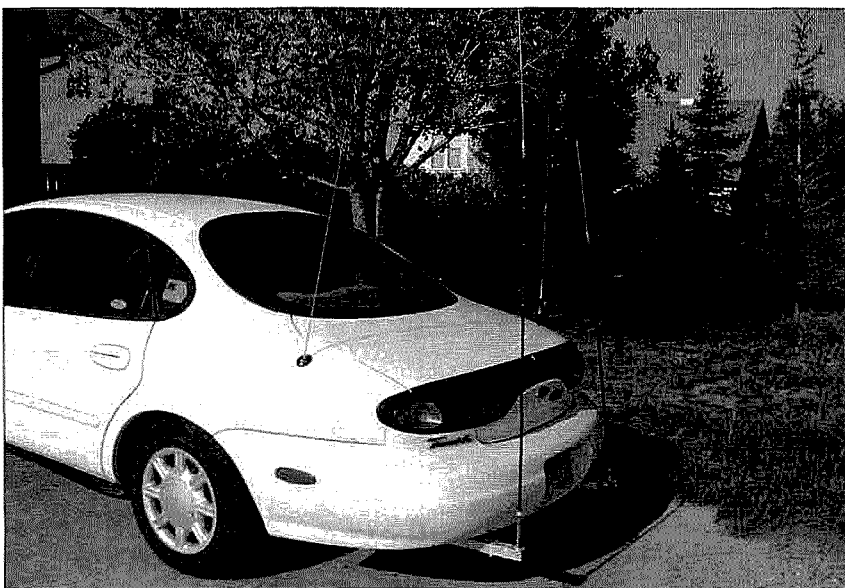


Photo A. Fashion experts say that the multiple antenna look is "in" this year. Besides the 2-meter/440-MHz antennas glass-mounted and on the trunk, there's an Iron Horse 6-meter antenna on the right and a matching 20-meter antenna on the left.

would work. I measured the distance from the jack mount to the edge of the bumper and thought that 9 inches would suffice. I failed to include the fact that the curvature of the bumper would require a few more inches. I'll save you the gory details, but ultimately the length of the antenna mount turned out to be 12 inches.

I checked out my local home improvement store to see what type of bar stock they might have available. There was a selection of angle iron, iron bar and aluminum, but most was thinner than I would have liked. A large antenna, after all, can function much like a large lever and I didn't want my mount to produce a 6 foot curb feeler dragging behind the car. I decided on aluminum angle stock that measured about 1-1/4" per side. The angle stock was about half the thickness of the original bar stock that I was seeking. I believed that while the horizontal piece of the angle would give me a place to mount the antenna and connect to the car, the vertical segment would provide greater strength. Eventually I decided to take two pieces of the aluminum and build an inverted "U"-shaped channel. This would give me a double thickness to mount the hardware, with a vertical piece on either side.

While I have a reasonable selection of hand tools, I knew this would be easier to complete with a little more horsepower. The home improvement store had the usual selection of high-quality, heavy-duty tools, but also had some items designed for those of us with an occasional need. I found a small drill press for just under \$40 that made the job significantly easier.

I drilled a 1/2-inch hole one inch from each end of the aluminum. When I drilled the first hole, I used it to mark the second one so that everything lined up. The 3/8-inch 24 mount requires a 1/2-inch hole to accommodate the nylon insulator. I decided to use the same size for mounting the bracket to the car using a 1/2-inch bolt, with a large flat washer above the hole in the jack stand bracket and a lockwasher and nut below. Incidentally, the jack stand brackets are not precisely installed, so you may need to shim the bracket slightly to have a perfectly vertical antenna.

After mounting a bracket to each of the rear jack stand brackets, I ran coax from the antenna mount through a hole in the bottom of the trunk. Usually there are some openings that have rubber plugs installed by the manufacturer. I removed the plug, routed the wires and cut a slit into the plug so that I could replace it around the coax. This grommet will help to prevent the coax from rubbing against the metal of the car

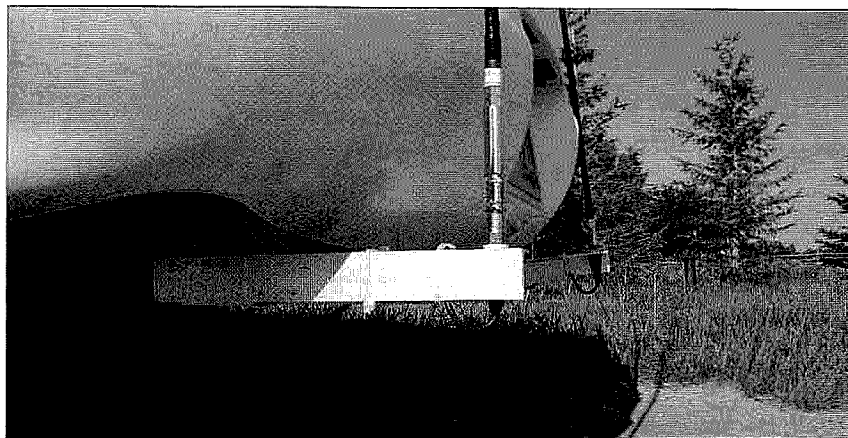


Photo B. When faced with a tall antenna and a plastic bumper, one option is to construct an extension that mounts to the automobile frame and extends just beyond the bumper. The extension here is mounted to the support normally used to connect to the jack used to change tires. The cable ties keep the coax in place.

body and shorting. I then routed the coax along the plastic trim below the doors to the front of the car. Add some coax seal to the connection between the antenna mount and the cable and you're pretty well done. There are all kinds of opinions about how, or even whether, coax connections should be finished, but I've generally had good luck with the putty-like tape that is wrapped around the connection then blended into a single layer with the fingers.

Incidentally, I normally make my own cables and try to stock up on PL-259s and adapters whenever I hit a hamfest. I had not been to a hamfest in a while and stopped by the local Radio Shack to pick up the supplies. Surprisingly it was cheaper to purchase manufactured 20-foot RG-58 cables than to purchase the individual components.

I had already decided where I wanted to operate on each band. The six- and ten-meter antennas cover a fairly wide bandwidth, so that was no problem. Twenty meters is a little more challenging because I prefer to operate in the lower segment of the band to cover the advanced and extra segments (14.150–14.225 MHz), but I also need coverage for the MARS frequencies, which are above the top of the ham segment of the band.

I assembled the antennas, which involves adding the stainless steel whip onto the fiberglass base that includes the coil. I prefer to use the quick disconnects that Iron Horse sells for two good reasons. First, there is the obvious ability to quickly switch antennas. Second, by using the quick disconnects, there is very little change in the SWR if you switch the antenna to another vehicle.

I set the radio to the center of the segment of each band where I wished to operate, listened to make sure no one was on frequency, set the radio to low power, and checked the SWR. On each band I was able to tune the antenna so that the needle barely moved when I measured the reflected signal. Iron Horse recommends that you trim the unused portion of the whip rather than leave it inside the fiberglass base, so I cut the excess, and tightened the hex screws and the ferrule that connects the whip to the base. I like things easy, painless, and ready to operate.

The Iron Horse HF antennas are, in my book, serious antennas that don't cost an arm and a leg. They can handle up to 250 watts and provide a reasonable band segment on all the popular bands. They are tall enough that there is a reasonable amount of metal in the air to get a good signal. The 20-meter antenna is just under 100 inches tall. With my antenna bracket 2 feet from the ground, this presents almost 10 feet above the ground. The other antennas are comparable, with the exception of the six-meter antenna. The six-meter antenna is low enough that I leave it on all the time. I do remove the HF antenna for garage parking, but with the quick disconnect, I can have it on the car and be in the driver's seat operating within 60 seconds.

Given how band conditions change and the performance of an antenna is impacted by surrounding terrain, it is always difficult to compare one mobile antenna to another. However, so far I am getting excellent signal reports, and significantly better than I did with my multiband. That's enough to make my mobile operating fun, and that was what I was trying to accomplish.

100 WPM and a Blown Mind

If your typing skills are anything like mine, PSK63 will truly blow your mind. I mean, it is visibly twice the speed of PSK31. The claim is 100 words per minute. I admit that is way faster than I can rattle the keys.

I had read a bit of discussion about the mode and took a look to see what the excitement was about. There was a rumor that Dave AA6YQ had incorporated it into his WinWarbler, so I looked there first. Best I could see, he was promising a release in "the near future," and it has already arrived, even as I write.

However, the best part was Dave published instructions on his Web site, to set up the new mode in conjunction with regular WinPSK. I printed those instructions, followed them, and it worked perfectly. I came up with two icons on the desktop, one for PSK31 and the other for PSK63. Both use the WinPSK format, which involved rebooting the program to change modes.

This shutdown and reboot is a quick operation, and you discover quickly that you will stick with one or the other modes long enough that mode switching is not really an inconvenience. It didn't take long for this switching arrangement to become a thing of the past, as other programs incorporated the mode.

The scene changes

As soon as I had made the above setup and made my first PSK63 contact, the developments started surfacing rapidly. Within a day or two, the MixW2.08 became available with this mode as a standard feature.

I installed the new version and wrote the simple macro to invoke the PSK63 mode and lie in wait around the 14.073 area and got a first contact with that software. The interesting part was that the other ham was using the WinWarbler package, which also had the new capability.

So, here were three programs suddenly available to work this exciting new super-fast mode. There is an advantage to both the WinPSK and the WinWarbler — They are FREEware. That is a hard-to-beat price.

The WinWarbler has an excellent right-out-of-the-box feature incorporated in the front panel that allows a quick click to choose between PSK63, PSK31, and RTTY. Very quick and easy, no macros to write.

I noticed as I used the MixW2.08 that, when the PSK63 mode was invoked by use of the macro, the mode in the built-in log reads BPSK63, so that part is fully automated. These ham programmers think of everything.

You may feel intimidated by the high speed capabilities, but you are not alone. Very few hams type at anywhere near the 100 word per minute capacity offered by this mode. However, there are some real advantages when you compare this to our regular speed modes and even RTTY, which is quite quick in its own right.

PSK31 could become a great quick turn-around contest mode, and that is hardly a far-fetched opinion. I think the avid contest folk are already considering it, from some comments I have seen.

There is more when you consider all the time wasted with the average brag-file. By comparison, when I first got the WinPSK combo up and running, I spent some time calling CQ and made timed runs on the CQ macro pitting PSK31 against PSK63. It should not have surprised me, but it did. The old, slow PSK31 took 30 seconds to run the macro. The same macro in PSK63 took just 15 seconds. I would say that is a scientific enough experiment to declare the speed is, as advertised, twice as fast.

Think about it. We could, just to cover up our typing inadequacies, start using even more macros and getting everything said before the path disappears. I did notice there was far less time to type ahead, which is my approach to holding up my end, while the other ham is sending his message. Ordinarily, I can have most of my thoughts in

the buffer by the time the other ham turns it back to me, but that certainly has not been the case thus far with PSK63. I may be busily typing ahead and have 10 or 15 words typed in and suddenly realize he is waiting for me to transmit. I need to make an adjustment to my brain speed. Even my macros seem to have grown shorter.

PSK63 development credit has to go to Skip KH6TY. I heard him several times in the past few days, but have not had a chance to work him. Propagation has its ups and downs, but I am sure that as active as he is with his new brainchild, it won't be long before we meet over the air.

Skip is certainly no newcomer to digital innovation. If you take a look at the DigiPan credits, you will find he is one of the contributors to that fine piece of software as well. I often recommend DigiPan as a first go at digital ham software for newcomers. And I find a lot of hams, once accustomed to DigiPan, simply stick with it. Something to do with the don't fix what ain't broken philosophy.

You gotta try it

With two freebie choices plus the availability in MixW (which has a small price tag), the PSK63 is quick and easy to get, install and get it on the air. I don't think I spent 15 minutes getting any of these three programs installed and ready to play, and they are all excellent. It is always fun to play with a new toy and this one is just that, a really fun new toy.

Not-to-be-forgotten modes

Incredible as it may seem, there are other similar modes already available, but we neglect to take advantage of them. I am

Continued on page 50



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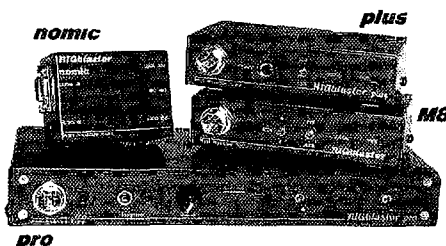
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THE DIGITAL PORT

continued from page 48

referring to some excellent innovations by Nino IZ8BLY, contained in the Stream package.

Packaging is probably where the neglect comes in. If you have looked at and/or used the Stream software you found it was different from our regular click and play ham programs. I am only guessing, but that little difference in appearance has likely led to general lack of acceptance.

However, I have to defend this piece of work because without Stream I am not sure if we ever would have been introduced to the MFSK mode. Within that one Stream package you will find PSK31, PSK63F, PSK125F, MFSK8, and MFSK16. Incidentally, the "F" in the two PSK modes stands for Forward Error Correction (FEC). The FEC tends to hold down the speed we are seeing with this new PSK63 we are talking about this month, but it has its advantage in that it provides dependable text transfer.

All I am saying is, I wanted to make all of you aware of these already-in-place modes, plus avoid someone sending me messages that I wasn't giving credit where credit is [also] due. All these hamware inventions are great. Some are simply underutilized.

Other stuff

Recently, I was working with the TrueTTY software — and there are a lot of new features. The first that comes to mind is that the MFSK16 mode is added. It has been there for some time, but I was working a ham who said he had tried TrueTTY a year or so back and was unaware of MFSK ability.

I too recall using the software in what might be termed its infancy, but it has really come of age. I read something recently where the author, Sergei, had added the waterfall option in addition to the spectral display for tuning. Waterfall is available for toggle by using the Alt+W hotkey.

The waterfall works very well. It was probably added because hams have become

accustomed to waterfalls over the past few years. Personally, I often prefer a spectral display for accurate and easy tuning since it gives a good perspective of quality and strength. Plus, if you use filters from your rig, it is a bit easier to tell where you are after the filter is invoked. But, for those who prefer a waterfall, TrueTTY has it now.

TrueTTY and other associated software such as AALog and CwGet are available at the DXSOFT Web site. These are shareware packages but you can download them and use them prior to registration. I see more hams using this group of software these days. Good stuff.

Speaking of innovations, I found the notch filter in the MixW2.08 after poking around a bit. I kept reading it is there, but wasn't really looking for that as much as I was the PSK63 mode. So, about the third time I right clicked on the waterfall, I got around to reading all the options in the little pop-up window and, sure enough, there it was.

Wherever you right click in the waterfall, a subsequent click on the filter line will notch out that section of the spectrum and hopefully get rid of an offensive adjacent signal. And, if that isn't fascinating enough, you can put more than one notch in at a time. That is, you can blank out the signals on both sides of the wanted signal. Looks like great fun for experimenting. Possibly, when I am trying to copy the wee little signal next to the big one I can't quite overcome with the rig filter, this will put the icing on the cake. We shall see.

Things that need help

Occasionally, my super-duper Win98se system allows a little corruption in a file and it will only fix manually. This is not wholly a personal problem that occurs only at this shack. As some of you know, I have gone to extra effort to keep this version of Windows running as clean as I can, but the following scenario happens anyway.

The MixW program will load but remain minimized in the task bar. On those occasions, it is possible to get it to maximize by right clicking and then clicking Maximize — sometimes. Of course, that is not a fix even when it works.

So I found the solution is to edit a line down in the middle of the MixW2.ini file under the [Window] heading. (IsMinimized=0) changes its value to a 1 and requires editing. This has happened several times in the past year and I have noticed others complaining and looking for a fix. The only fix I know is to open the file in Notepad and edit that line.

If I were the only one with the symptoms

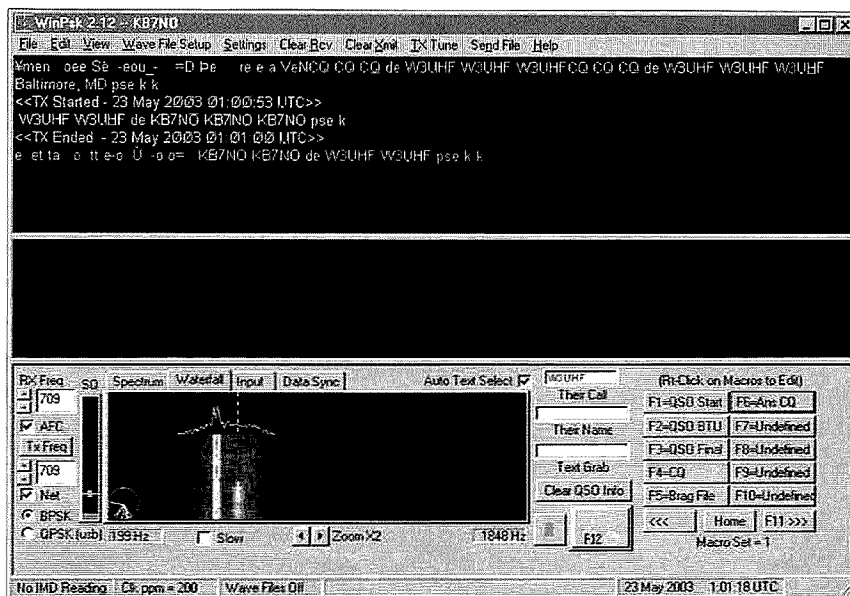


Fig. 1. 1st QSO via PSK63 — This is the WinPSK software with the PSK63 module up and running and showing evidence they heard me answer their CQ! See the text for directions to set up this bit of freeware to try this mode for yourself. The PSK63 responds the same as using PSK31 except for the speed. By my measure of timing, it is precisely twice as fast. You will be amazed. The waterfall display indicates I had a narrow filter in place from the rig, hence only two signals showing. The active trace on the left was not the answering signal. It was the one to the right that is disappearing down the waterfall. Things were going so quickly, that by the time I decided to snap the screenshot, the other station came back to me a second time. But we worked and it was only his third QSO in the PSK63 mode. Activity after these first few days picked up rapidly as two more software packages came on the scene. (See text.) At the early phase of the PSK63 adventure when this was being written, this software did not have a way to change modes without shutting down the program and rebooting from a shortcut icon. This only takes a few moments and you find is not often necessary. The other two programs that came along shortly can be switched internally. This is very fascinating, if for no other reason than it is really fast, about 100 wpm!

I would not mention it here, but this may be of value to others. The fix, in the beginning, was a bit intimidating, but once I discovered the solution it is just something that must be dealt with occasionally. For-what-it-is-worth.

Power and antennas

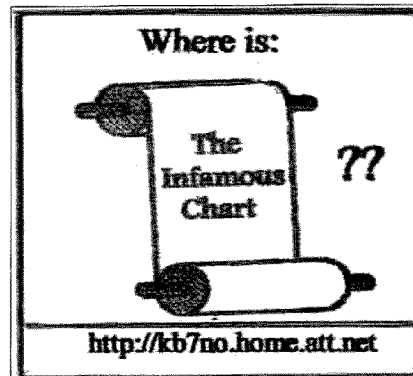
You probably agree, if you have observed/ worked the digital modes on HF for any more than a few weeks, there is not a great need for the "big signal." That is, digital modes are making it reliably to anywhere the path is open with 50 watts or less.

I was walking with the XYL the other day and we were just a few blocks from home when I pointed out that this "new" neighborhood surely had restrictions that would force a ham into using stealth style antennas. The reasoning for my statement is all the power lines, as well as phone and TV are underground there.

The wife is only vaguely interested in

these facts, though she is supportive of my rights to practice ham radio with at least a reasonable size antenna aloft. What struck home to her with this subject was when I reminded her how one of our kids bought a home in southern California some years

Continued on page 61



Doppler Antenna Design Secrets

Last call! Hams from around the country are packing their bags and making final tweaks to their radio direction finding (RDF) equipment in preparation for the Third USA Championships of Radio-Orienteering.

Members of the OH-KY-IN Amateur Radio Club are ready to greet the planes and cars bringing fans of on-foot international rules foxhunting, arriving a week or two after this magazine reaches your mailbox. There will be two challenging forest courses, July 31 on two meters and August 2 on 80 meters. Medals and adulation await the winners in each of nine age categories, five for men and boys, four for women and girls.

It's probably not too late to get in on the fun in Cincinnati. The events are open to anyone, at any RDF skill level, with or without a ham radio license. Go to [www.ardfusa.com] for the latest information and entry forms. Previous "Homing In" columns in 73 have lots of information on ARDF

rules and equipment.[1] There will be a full report on this year's festivities in an upcoming issue.

Happy 200th!

"Homing In" for July explained the importance of a VHF/UHF Doppler antenna array being as nondirectional as possible. Although it may be counter-intuitive, it's true that any factor that causes the amplitude of the received signal to vary as a Doppler array is electronically "rotated" will result in the display being jumpy, hard to interpret, and perhaps even downright unreliable, especially as the vehicle moves through areas of signal reflections.

These undesirable amplitude variations

can have many causes. Last time, I demonstrated that mounting a Doppler array (or any other VHF communications antenna) on the corner of a vehicle roof results in at least 4 dB amplitude variation around the azimuth circle, compared to placing it in the center of its counterpoise. Putting it on a blocked surface such as the hood or trunk is far worse. Even if you mount it right in the middle of an unobstructed ground plane, other VHF/UHF antennas in proximity can "pull" the directivity of your array.

Even more important, yet more often overlooked, is the significance of non-directivity in the entire assembly of whips or dipoles. In the examples to follow, I'll assume a 146 MHz array of four quarter-wavelength vertical whips with typical spacing, as in Photo A. But the principles apply to arrays of more whips, and for other VHF/UHF bands.

Fig. 1 is a simplified schematic of the antenna switcher section of a typical Doppler set of the early 1980s, the Dick Smith Electronics (DSE) Model K-6345 from Australia. Series diodes D1-D4 are located on a circuit board in a plastic box, intended to be affixed to the vehicle roof with a suction cup. Wire lengths from each series diode to the common point are exactly equal, about one inch. Separate coax cables, each about 30 inches long and all four equal in length, go from the switcher to the vertical whips. At each whip base, a shunt diode (D5-D8) is connected from the whip base to the ground plane and coax shield.

To turn on each whip in sequence, a negative logic voltage is impressed through the whip's RF choke (L1-L4) such that its series diode is forward biased (on) and its shunt diode is reverse biased (off). At that instant, the other three whips get positive logic voltage to bias their series diodes off and shunt diodes on. So whenever Whip A

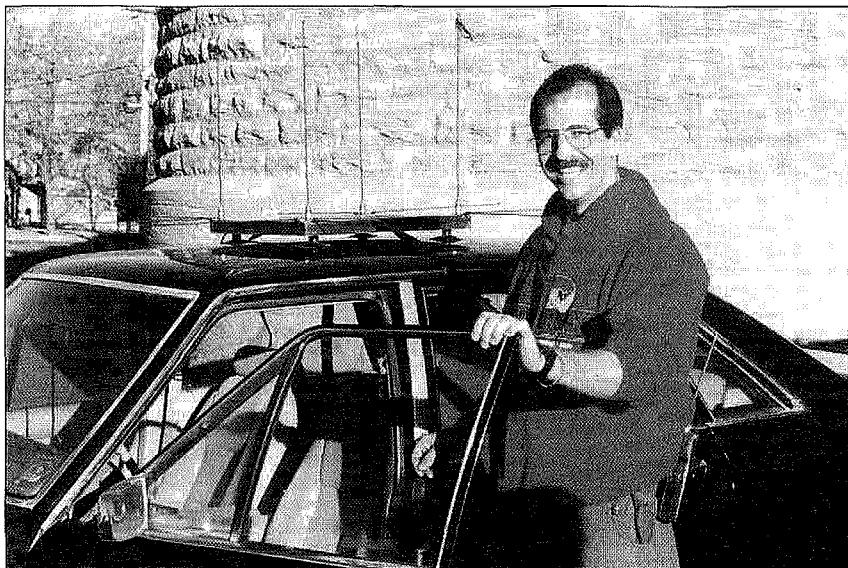


Photo A. Many Doppler builders choose a one-band antenna array like this one for two-meters used by Louis Tremblay VA2JX of Montreal. It has four quarter-wavelength whips in an 18-inch square pattern on a metal plate, plus eight radials to provide a symmetrical ground plane under each whip. The one-piece assembly mounts quickly and the whips are always perfectly spaced and aligned. (KØOV)

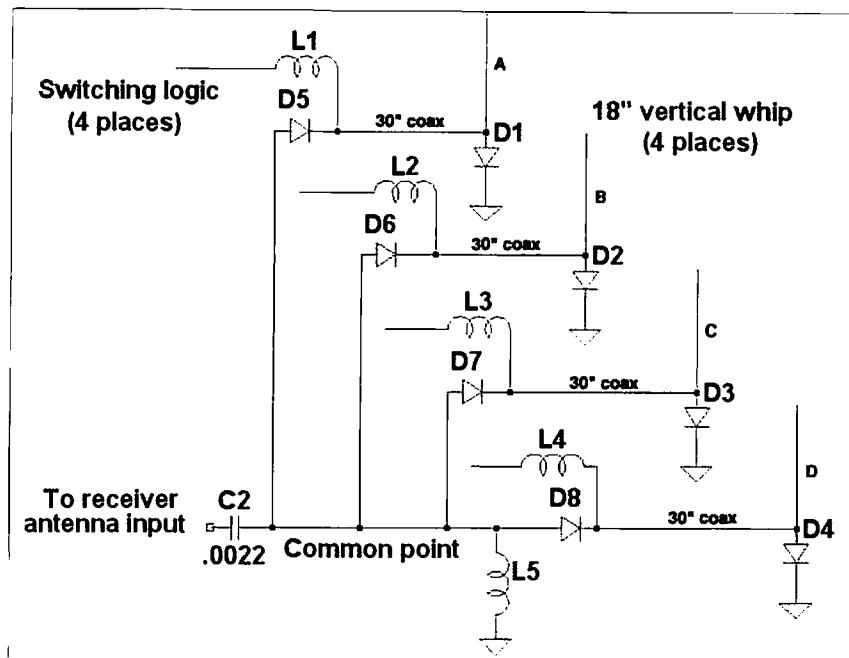


Fig. 1. Simplified schematic of the Dick Smith Doppler RF switcher section. Inductors L1-L5 are RF chokes.

is switched into the receiver, whips B, C, and D are switched out and grounded by their shunt diodes, and so forth. The logic voltages are switched in sequence at an audio rate to perform the electronic rotation of the array.

In my tests on real-world signals, the DSE K-6345 display was scrambled most of the

time as I drove along. Part of that was due to inadequate damping in the audio filter and phase detector stages, but I was convinced that the antenna system deserved much of the blame. It did, as you can see from analysis of the array using EZNEC, an antenna modeling computer program for the PC.[2]

For simplicity, my model was an array of four quarter-wavelength elements in an 18-inch square pattern over a perfect ground plane at an instant in time. One whip goes to the feedline and the others are grounded, as they are in the K-6345. Sure enough, the effect of those turned-off whips tied to ground by diodes is to create a multi-element parasitic array that is highly directional in amplitude, as Fig. 2 shows. Gain of this array varies more than 11 dB around the azimuth circle. As it is electronically rotated, incoming signals and reflections undergo huge undesired amplitude jumps, in addition to the desired phase jumps.

To prove that the shunt RF diodes are the cause of the amplitude directivity problem, simply change the EZNEC model such that switched-off whips are "floating" with no connection to the ground plane, as they would be without the shunt diodes. That gives the excellent pattern of Fig. 3. There is just 1.3 dB variation around the azimuth circle, which is almost insignificant. Could this be an approach to the perfect Doppler array? Yes, but if the shunt diodes are simply deleted from the circuit of Fig. 1, we won't achieve it. That's because the switched-off whips "look back" into an uncontrolled length of coax cable terminated in an open circuit (the switched-off diodes D1-D4).

Coax as a transformer?

Let's take time out for a brief explanation

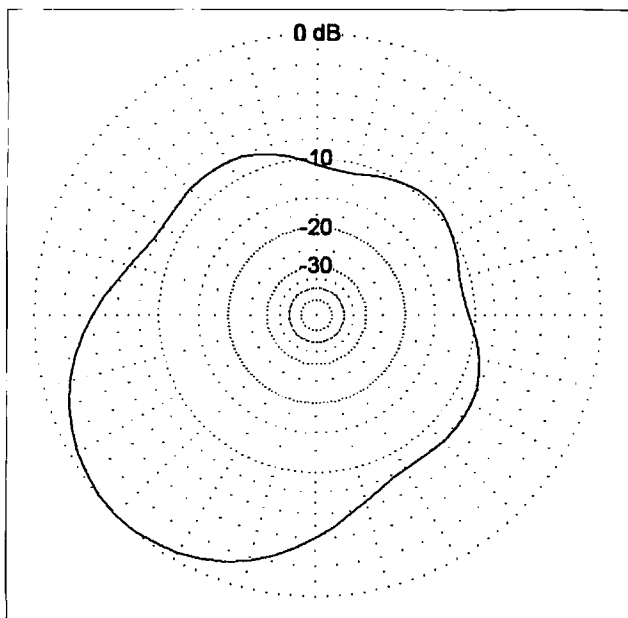


Fig. 2. EZNEC azimuth pattern plot of a 4-whip Doppler array with three whips grounded and one connected to the feedline. The large lobe is in the direction of the active whip, which is in the lower left of the array.

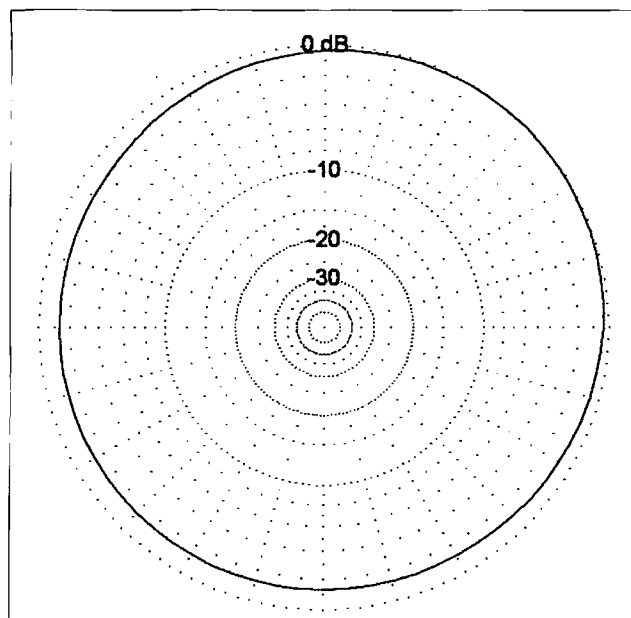


Fig. 3. The undesirable lobe disappears and a nearly perfect circular pattern with no phase anomalies is achieved when the switched-off whips are open-circuited to minimize parasitic effects.

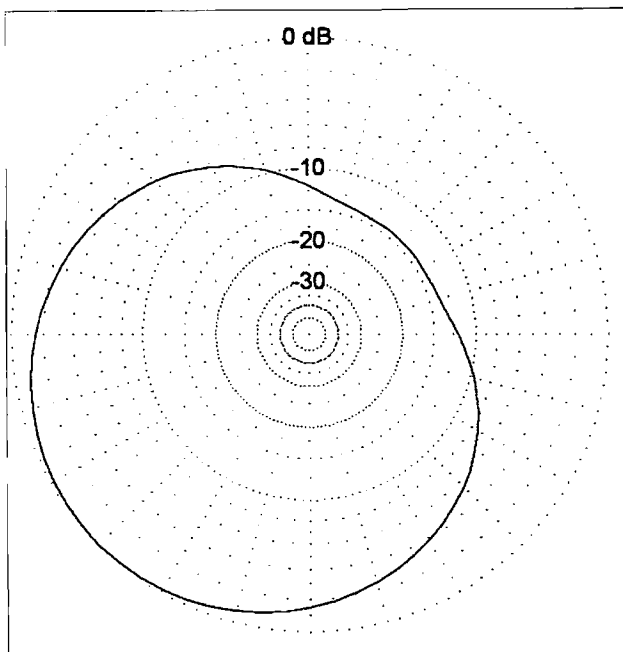


Fig. 4. With reactive termination of the switched-off whips, the amplitude pattern is even worse than for the grounded case.

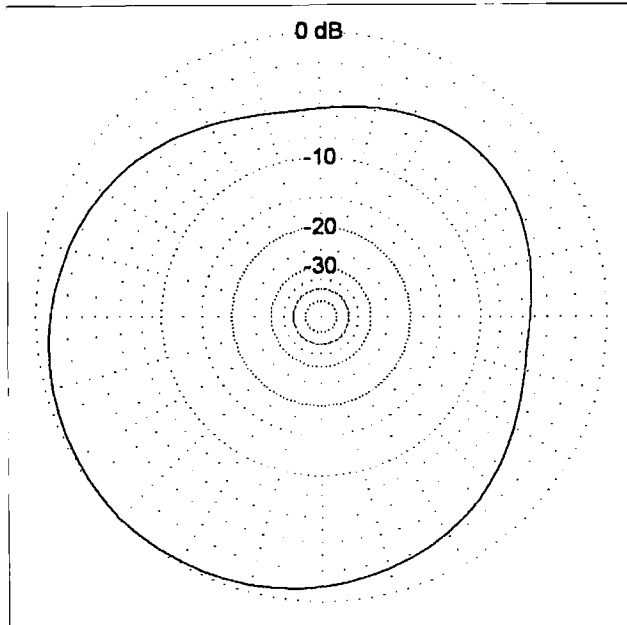


Fig. 5. When inactive whips are terminated by 50 ohms, as they are in preamp-type Doppler switchers, the directivity is acceptable. But it's not as good as in the open-circuit case.

of the effect of transmission line length on impedance mismatches. Perhaps you have heard of using "stubs" to get optimum SWR on coax or ladder line when your antenna or other RF load doesn't have the same impedance as the line. When a mismatch occurs, the effective impedance at any point in the line varies along the length, as does the RF voltage and current.

These variations are periodic, repeating almost exactly every half-wavelength. The only variations in these half-wavelength repetitions are caused by RF losses in the coax. They can usually be neglected unless the line is very long or very lossy. The ratio of maximum to minimum current, voltage, or equivalent impedance along any half-wavelength section of the line is the SWR.

If we know the terminating impedance and line length, we can determine the transformed impedance at the radio end of a transmission line by several methods, including computer analysis. The easiest and most familiar way for long-time hams and engineers is the Smith chart.[3] This graphical aid shows the impedance transformation for any line length and any terminating impedance, relative to the cable's characteristic impedance.

For instance, if you develop a short at the antenna end of your station's feedline, your transmitter will not "see" a short at the shack end of the coax unless the line length is exactly an electrical half-wavelength. If the line is very short, about one-eighth wavelength, the line-load combination will appear

as if it were a resistor and an inductor. At $3/8$ wavelength, it appears resistive and capacitive. And at $1/4$ wavelength, the short circuit load is transformed into the equivalent of an open circuit! For longer lines, the transformations repeat every half-wavelength.

There are some simple transformations for which we don't need a computer program or Smith chart. For instance, an electrical half-wavelength is effectively a 1:1 transformer. A 70-ohm antenna will appear to the transmitter as exactly 70 ohms at the end of a half-wavelength of coax, even if it's 50-ohm coax. A quarter wavelength of line inverts the impedance, turning opens into shorts and vice versa. A 10-ohm resistor appears as a 250-ohm load at the far end of an electrical quarter-wavelength of 50-ohm coax.

Note the term "electrical length." Waves slow down in practical transmission lines. The velocity factor of solid polyethylene dielectric coax (such as RG-58) is about 66 per cent, meaning that an electrical quarter wavelength of it at two meters is close to 13 inches, compared to about 19.5 inches in air. Other cables, such as foam dielectric types, have different velocity factors. There is a table of values in *The ARRL Handbook*.

What is the equivalent impedance seen by the switched-off whips in the DSE Doppler when the shunt diodes are removed? The practical open-circuit resistance of the series diodes is transformed by about 220 electrical degrees of coax into a complex impedance. The Smith chart answer is $9.5 + j48.5$ ohms, the equivalent of a

9.5 ohm resistor and 53 nanohenry inductor from the base of each parasitic whip to ground plane. Plugging that into the EZNEC analysis gives the pattern of **Fig. 4**. Wow, there is over 14.1 dB variation, even worse than the shunt diode case!

How can the DSE circuit be changed to get the desired pattern of **Fig. 3**? It's easy, just cut the lengths of the coax lines between the series diodes and whip bases to one-half electrical wavelength, which is 26 inches of non-foam RG-58. That length moves the open circuit of the series diodes once around the Smith chart to present a perfect open circuit at the whip bases. This modification helped make major improvements to the performance of the Dick Smith Doppler set when I did a product review of it 16 years ago. I wrote an article about my findings[4] and subsequently heard from many other hams who made the changes with similar results.

For the Roanoke Doppler in my book,[5] I used coax impedance transformation in a different way. There are no series diodes. Shunt diodes are in the exact center of an electrical half-wavelength of coax line for each whip. At each instant, the diode for the active whip is biased off and the three others are biased on, shunting RF from those whips to ground. The electrical quarter-wavelengths of coax on each side of the shunt diode transform the RF short of the diode to an effective open circuit at each

Continued on page 56



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HOMING IN

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end, making possible the ideal amplitude pattern of Fig. 3 and preventing the shunt diodes from loading down the RF common point.

Whichever circuit you choose, these Doppler antenna switching schemes can provide excellent results if you carefully trim the individual whip coaxes. The downside is that they work well over just a narrow frequency range, such as a single ham band. A switcher built for the 120 MHz aircraft band wouldn't be right for the two-meter ham band, because the coax lines would create reactive terminations on 2m. For a one-band one-piece array such as **Photo A**, that's not a problem. But the switcher for a set of four mag-mount antennas with whip lengths and spacings changeable for multiple bands must be more frequency-independent.

I solved that problem with a new design that has series diodes at both ends of the coax, to ensure that switched-off whips see an open circuit and the common point isn't loaded down, no matter what the electrical length of the coax. (All four coaxes still have to be exactly the same length, of course.) Complete plans for this wide-range Doppler switcher can be downloaded from the "Homing In" Web site. It works with the Roanoke Doppler and features bipolar biasing of the PIN diodes to minimize on-resistance (lower loss) and maximum off-resistance (best isolation). It can be adapted to many other Doppler set designs.

50 ohms all the way

Some designers of commercial and home-built Doppler sets prefer to use active preamps for each antenna element, switched on and off to create the pseudo-rotation of the array. The preamps must be identical and coax line lengths must be exactly equal to achieve equal phase lengths around the array. Since preamp input and output ports are intended to match 50-ohm coax, relative line length should not be a consideration and wide frequency range should be achievable, limited only by the preamp bandwidth.

What does 50-ohm resistive loading of inactive whips do to the amplitude response of the array? The EZNEC answer is in **Fig. 5**. Gain variation is 5.4 dB. That's low enough directivity for acceptable performance in multipath, but I prefer the dual-diode approach of the Roanoke wide-range switcher. Monolithic preamps have gain, which can overcome the small amount of loss in the coax from antenna to receiver. But they usually have noise figure that is much worse than most receivers. So unless you are using a very insensitive receiver,

there is a good chance that antenna preamps will do more harm than good from an overall sensitivity standpoint. What's more, RF gain ahead of the receiver will worsen any receiver overload and cross-modulation problems. Strong signals can also overload the preamps, distorting the incoming signal phase and degrading the bearing accuracy.

One last point for now: Use good PIN-type diodes in your Doppler switcher, not ordinary silicon switching diodes. PIN diodes provide significantly less insertion loss when on, if biased properly, meaning that a PIN switcher will generally have less loss. More importantly, stray RF rectification is much less likely with PINs. In my tests, I encountered significant cross-modulation problems using a Doppler with non-PINs, especially when driving near strong RF sources. Suppliers of PIN diodes are listed in the Hardware Sources page of the "Homing In" Web site.

OK, you have optimized your switcher design for zero loading of switched-off whips. You found the perfect centered place to mount the array on the vehicle and you moved all the other antennas far away. But your mag-mount Doppler set display still dashes around in multipath more than you'd like. Are there more secrets of success for Doppler antenna sets? Yes, and they're coming in the next installment of this series. Meanwhile, I want to hear about your experiences in building and using Doppler RDF sets. Send stories and photos via Internet or the Post Office to the addresses at the beginning of this article.

Notes

1. "Homing In: Two New Tools for T-Hunting" in *73 Magazine* for April 2003 has more details on the championships and a new ARDF set for two meters.

2. By Roy Lewallen W7EL, [www.cznc.com].

3. Smith chart is a registered trademark owned by Analog Instruments Company, New Providence, NJ. Detailed explanations of coax impedance transformation, stubs, and the Smith chart are in recent editions of *The ARRL Handbook* and *The ARRL Antenna Book*. Smith chart resources on the Web include [http://www.scott-inc.com/html/smith.html].

4. Moell, "The Weekender: An Improved RDF," *Ham Radio Magazine*, July 1987. This article is available at the "Homing In" Web site under the title "Improving the Dick Smith Radio Direction Finder."

5. Moell and Curlee, *Transmitter Hunting — Radio Direction Finding Simplified*. TAB McGraw-Hill. ISBN 0-8306-2701-4. Plans for the Roanoke Doppler are in Chapter 9. **73**

Clamp-On DC Ammeter

continued from page 17

aspects of the project that come to mind are: (1) sensitivity to extraneous ferrous objects; (2) noise within the amplifier; and (3) the high supply voltage requirement for portable operation. Even the errors in calibration are tolerable as long as the indication error is known.

On the positive side, the experience gained through experimentation with Hall-Effect devices opens the door for "new" projects. I suspect that there are many applications that apply to ham radio projects, but we as hams need to ferret them out and expose them for the rest of us to use. Consider these applications as a starter: indicating burned out lights on a vehicle; indicating when power is applied to a remote piece of equipment; as a remote ammeter for cars and airplanes; and/or indicating the current value being drawn by a remote piece of equipment. The number of desirable applications is limited only by your imagination.

I hope that you will find some merit in building and experimenting with the ammeter, even though you may not have a direct use application in mind at this time. What you gain from the exposure to Hall-Effect sensors is well worth the effort. Should you have an interest in this type of a project, please feel free to change the design to fit your application and need. 73!

Reference listings

- Allegro Microsystems, 115 North-east Cutoff, Box 15036, Worcester MA 01615-0036.

- Allegro Microsystems, 162 Pembroke Rd., Concord NH 03301; phone 505-853-5000.

- Hall-Effect sensor, p/n A3515EUA or A3517EUA. Approximate cost, \$1.00 each plus shipping. Single/multiple part ordering info, on-line credit card purchase only: [www.allegroebiz.com/ebiz1/purchase/]. (a) Special purchase log-on. (b) Create an account. (c) Provide the requested information.

- Hall-Effect data book, AMS-702 and app. note 27701 [www.allegro-micro.com]. A3515xUA data sheet 27501.10B.

- Cores available from All Electronics. 1-800-826-5432 or [www.allcorp.com]. Cores: TOR-4. 0.50 o.d., 0.28 i.d., 0.18 wide, 10 @ \$1.00. TOR-23. 0.50 o.d., 0.30 i.d., 0.10 wide, 10 @ \$1.00. TOR-28. 0.87 o.d., 0.50 i.d., 0.25 wide, 3 @ \$1.00.

- Cutoff disks. Available in most hardware stores. Forney, Cat. 71794, 3" diam. with a 1/2" center hole. Harbor Freight, phone 1-800-423-2567, fax 1-800-905-5220: 4.5" diam., 1/16" thick, p/n 4530, 10 @ \$7.00. 4.0" diam., 1/16" thick, p/n 4532, 10 @ \$7.00.

- Hall-Effect Sensor Experiments, 73 Amateur Radio Today, pg. 25, January 2003, Hugh Wells W6WTU. 73

The Ins and Outs of Parts Substitution

continued from page 22

circuit. Therefore, matching a silicon NPN or PNP for a like germanium device may not always create the desired results. The solution may require a complete circuit parameter evaluation to restore the desired function. In other words, the modern transistor must have its functional parameters met for the circuit to function as desired.

Comments

If you've followed along with the details of the discussion up to this point you'll see that there are many decisions involved in making a substitution "call" for a specific device. However, the "call" is aided with a little legwork that leads one through the process of understanding what the

part is being asked to do in the circuit, and then selecting an available part that will fit into the roll of the requested one.

Part 1 of this series provided the typical steps involved in examining the part, circuit, and the tools that are available to assist in finding a substitute part. Part 2 will pick up with a continuation of the selection process as it relates to FETs, ICs, and special devices. 73

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UG-21B/9913	N Male for RG-8 with 9913 Pin	6.00
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**DESIGNS
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How to Check Transistors with an Ohmmeter

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power transistors, it will probably be necessary to switch to a lower resistance scale to get a usable reading.

Usually you need not worry about burning the transistor up with excessive current, as power transistors are designed to stand far more than the 100 milliamperes or so of the normal ohmmeter on the R X 1 scale. On the other hand, these new, small-signal silicon transistors have such small leakage currents that it is often impossible to get any reading with the base open and using the R X 100 scale. This need not be a deterrent, however; just go right ahead and touch the base lead to the collector — the ohmmeter should now read something downscale from the infinity mark, indicating a good transistor. You can switch to a higher resistance scale, but care must be taken that the voltage ratings of the transistor will not be exceeded as normally a higher battery voltage is used on the higher resistance ranges.

Incidentally, almost all ohmmeters, with the exception of the Simpson model 260, have their polarities reversed on ohms. That is, the black or common lead is tied to the positive side of the battery and the red lead is tied to the negative side of the battery. If you are in doubt as to your particular meter and do not have a separate meter to check, don't despair, just find an old diode that is marked and measure its resistance. In one position the resistance will be low and in the other position the resistance will be high. The negative lead on your ohmmeter will be the one that is on the cathode of the

diode when it is in the low resistance position. The cathode end of a diode is usually marked with a black band. In any case, it is the lead opposite the arrow in the diode symbol.

Fig. 4 shows the standardized lead configurations for most transistors. Unfortunately some transistors, especially the high power ones, do not follow a standard lead pattern. Normally in these the collector is tied to the case and the larger of the two leads is the emitter. In case you cannot decide which lead is which, try the original ohmmeter test on the diodes. Measure the resistance between any two leads, reverse the leads, and measure again. If there is a large difference in the readings, one of your transistor leads is the base. The lead that shows a difference in forward to backward resistance to both of the other leads is the base. The two leads that show no or the least difference are the collector and emitter.

By knowing which lead is the base, you can try the other two leads both ways to see which polarity gives a resistance decrease when the base is connected to the negative terminal. Assuming that you are dealing with a PNP device (which will be true 99 and 44/100% of the time for commercial transistors), the collector is the lead tied to the negative terminal.

This method, while not the world's best, is probably the world's cheapest, especially if you already own an ohmmeter! It certainly is as good as these cheap transistor testers one sees flooding the market, and a good deal handier. You just have to know how to cheat.

I would like to thank Mr. Jerrold Ford for the original idea and Mr. Robert Atherton for his help. 73

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Two Monitors Are Better Than One

continued from page 25

may have running in the second monitor. I can transfer anything from one document to the other without having to go away from the one I am using. You can work in either screen you want by just using the mouse to go to it.

It is very handy when you have a program up and running but want to get something from the desktop. For instance, I am now running the MixW program for PSK and have it minimized and moved to the left monitor. Now I can run the Wordpad program on the main computer and bring up the Wordpad again on the left monitor on top of the MixW program, and copy from one program to the other by just doing copy and paste. If I want to go to the MixW program, I just click on its running part and away I go, using it in whichever monitor I want.

If you have the Callbook loaded, you can run it on one monitor while using the program in the other. Then when you want to look up who you are working, you can just go to the log-book without leaving the program you are running. While watching my program Mix, I leave it running on the second monitor on the left while I go to the Internet and send cards to whom-ever I have worked via EQSL.CC. I can see the log in the Mix and copy the information I need to put on the cards.

Photo A shows my shack with the two monitors. The meter on the top of the main computer is a field strength meter which tells me that the transmitter is putting out RF. I sometimes change the background in the desktop to black, as it makes it easier to tell where the cursor is.

Now I can't see how I ever got by without using two monitors. I hope you get as much pleasure from this as I do. Look for me on PSK at approximately 14.070 PSK. 73 ... 73

Say You Saw It in 73!

G.I. Joe and Mr. Morse

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ABOVE & BEYOND

continued from page 43

leads and you should see the same junction resistance to ground on the second diode, which is connected in an anti-parallel configuration.

Now, with two diodes connected and testing good, make the IF port by connecting a single strand of the finest-gauge wire you can find. I used a single strand of 110 volt AC lamp cord and soldered one end of this single strand to the diode center connector. The other end is soldered to the unmodified SMA connector. This is the 2-meter IF port.

The drive from the 10 GHz synthesizer is the LO port of the mixer. The RF port is somewhat unconventional; it is the focused RF energy directed to the diodes on the back of the SMA connector themselves. Kerry had a 4-inch dish on his rig and pointed the mixer diodes into the dish at the focus point of the dish for tests. The diodes and SMA connectors were supported by 0.141 coax hard-line, positioning the mixer diodes to the focus point of the dish.

Other interesting applications from the mixer are its harmonic generating possibilities. Driving it at much lower frequencies into a single or even 2 diode arrangement works very well. This mixer has great harmonic generation capabilities. Frequency markers from lower frequency oscillators

have been observed as high as 10 GHz and as few as 24 GHz. The diodes used were "fly spec" size diodes and are quite small. They were used in commercial applications for 14 GHz so they exhibited great microwave capabilities already and were in a Stripline package that permitted us to solder them to the back of a SMA connector.

As is all material used in this project, even the SMA connectors were surplus. They were still a bargain and obtained at local swap meets. Even though it used some sophisticated components, most parts for this construction can be had in one form or another by using some good search techniques in your quest for that key component for your surplus junk box. As always, for any questions on this and other items please E-mail me at [clhough@pacbell.net] and I will try to answer your questions as best as I can. Good junk box hunting. 73. Chuck WB6IGP. 73

Travels with Henryk — Part 14

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issued in Delhi, in the north, and it takes a very long time to get anything processed there. Goa is still distinct in many ways from the rest of India. Everything is still influenced by the ages of Portuguese rule. Even the names — VU2CY is Cyril Salvador Martin,

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Photo G. VU2FCX's assortment of wire antennas.

The Good, the Bad, and the GLE

August promises to be an interesting month, with propagation conditions ranging from good to spectacularly bad.

The first half of the month will be similar to what July had to offer, with a few Good (G) days intermingled with numerous Fair-to-Good (F-G) and Fair-to-Poor (F-P) ones. However, beginning late on the 19th, I expect conditions to rapidly deteriorate with one or more large solar eruptions likely from the 20th through the 25th. I wouldn't be surprised if we see a major X-class flare or CME (Coronal Mass Ejection) accompanied by a proton burst that causes what is known as a GLE, or Ground Level Event. These are relatively rare occurrences that result in daylong radio blackouts and can cause surges in the electrical power distribution grid. Some of you may remember a flare on March 13-14, 1989, that completely disrupted the ionosphere for nearly 48 hours and triggered a widespread power outage in eastern Canada and parts of the northeastern US.

Whether or not my dire solar prediction for the third week of August comes to pass, we can certainly expect to witness another spectacular event — the peak of the Perseid meteor shower. Every summer, from July 23rd through August 20th, there is a marked increase in meteor activity as the earth passes through a relatively dense region of dust and debris left behind by the Swift-Tuttle comet. This annual event is named the Perseids because the meteors appear to emanate from the constellation Perseus. The "grande finale" for 2003 will occur on August 13th at around 0500 UTC, when we can expect to observe up to 75 "shooting stars" per minute.

Always a big event for star-gazers, the Perseids also come high on the list of many DXers since meteor showers can produce some astonishing radio propagation conditions. Known as "meteor scatter," it is not uncommon for radio signals to propagate up to 1,400 miles when reflected from the ionized trail of a meteor. You can

usually recognize meteor scatter from the audible whistles and pings they create, or the echo that they add to a signal. When a meteor

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15-20	(15-30)	20 (40)	(20-40)	x	(20)	20	(20)	(15)	(15)	15 (20)	(10) 17
South America	15 (20)	(15) 20	20 (40)	(20-40)	(20)	x	(15)	(15)	x	(10)	(10-20)	(10) 20
Western Europe	20	20	(20-40)	(40)	x	(20)	x	x	x	x	(20)	20
South Africa	x	(40)	x	(20)	x	x	x	x	(15)	(15)	x	x
Eastern Europe	20	20 (40)	(20)	x	x	x	(20)	x	x	(15)	(15)	(20)
Middle East	20	20 (40)	(20)	x	x	x	x	x	x	x	(20)	(15)
Far East	(15-20)	(20)	x	x	(20)	x	x	x	x	x	x	x
Japan	(15)	x	x	x	x	x	(20)	(15-20)	(15)	x	x	(15)
Southeast Asia	(15-20)	x	x	(20)	x	x	(20)	x	x	(15)	x	x
Australia	(15)	(15)	x	x	(20-30)	(20-30)	(20)	(20)	x	x	x	x
Alaska	(15-20)	(15-20)	(15-20)	20	20 (40)	(20-40)	(20)	(20)	x	x	(15)	(15-20)
Hawaii	(15-20)	(15-20)	(15-20)	20	20 (40)	(20-40)	(20)	(20)	x	x	x	(15)
Western USA	(10) 30	(10) 30	(10) 40	(15) 40	(20) 40	(20-40)	(15) 20	(10) 20	(10-20)	(10-20)	(10-20)	(10) 20
CENTRAL UNITED STATES TO:												
Central America	(10) 20	(15) 30	20 (40)	20 (40)	(20)	(20)	(15) 20	(15-20)	(10-20)	(10-20)	(10) 17	
South America	10 (20)	(10) 20	(15) 30	(15) 30	(20-40)	(20)	(20)	(15)	(15)	(10)	(10-15)	(10-20)
Western Europe	(15) 20	20	(20-40)	(20-40)	x	(20)	(20)	x	x	x	x	(15-20)
South Africa	x	x	(40)	(20-40)	(20)	x	x	x	(10-15)	(10-20)	(20)	x
Eastern Europe	(20)	(20)	(20)	(20)	x	x	(20)	(20)	x	(15)	(15-20)	(15-20)
Middle East	(15-20)	(20)	(20)	(20)	x	x	x	x	x	x	(20)	(20)
Far East	(15-20)	(15-20)	(20)	x	x	x	(20)	x	x	x	x	x
Japan	x	(15)	(15)	x	x	(20-40)	(20)	20	(20)	x	x	x
Southeast Asia	(15)	(15)	(15-20)	(20)	x	x	(20)	(20)	(15-20)	(15)	(15)	x
Australia	(15)	(15)	(15-20)	(20)	20 (40)	(20-40)	(20-40)	20	(20)	x	(15)	x
Alaska	(10) 30	(10) 30	(10) 40	(15) 40	(20) 40	(20-40)	(20-40)	(15-40)	(10) 30	(10-20)	(10-20)	(10) 20
Hawaii	(15-20)	15 (20)	(15-20)	20	20	(20)	20	(20)	x	x	x	(15)
WESTERN UNITED STATES TO:												
Central America	(10) 17	(15) 20	(15) 20	20	(20)	(20)	(20)	(20)	(10-20)	(10-15)	(15-20)	
South America	(10-20)	(10) 17	15-20	(15) 20	(20)	(20)	(20)	(15)	(15)	x	(15)	(10-15)
Western Europe	(15-20)	(20)	20	(20)	x	x	x	(20)	(15)	(15)	(20)	(15-20)
South Africa	x	x	x	(20)	(20)	x	x	(20)	(20)	(15)	x	x
Eastern Europe	(15-20)	(20)	(20)	(20)	x	x	x	(20)	x	x	x	(15-20)
Middle East	(20)	(15-20)	(15-20)	(20)	x	x	x	x	x	x	x	(20)
Far East	x	x	(15)	x	x	x	x	(20)	x	(15)	x	x
Japan	(15)	(15)	(20)	(20)	(20)	(20-40)	(20-40)	(20)	(20)	(15-20)	x	(15)
Southeast Asia	x	x	(15)	(15)	x	(20)	(20)	(20)	(15-20)	(15-20)	(15)	x
Alaska	(10-15)	(10-15)	15	(15-20)	20	20	20	(20)	20	(20)	x	(15)
Alaska	(10) 40	(10) 40	(10) 40	(15) 40	(20) 40	(20-40)	(20-40)	(20-40)	(15) 40	(10) 40	(10) 40	(10) 40
Hawaii	(10-15)	(10-20)	(10-20)	(15-20)	20	20	(20-40)	(20-40)	(20-40)	x	x	(10-15)
Eastern USA	(10) 30	(10) 30	(10) 40	(15) 40	(20) 40	(20) 40	(20-40)	(15-20)	(10) 20	(10-20)	(10-20)	(10) 20

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

August 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
					1 F-G	2 G
3 F-G	4 F	5 F-G	6 F-G	7 F-P	8 F-P	9 G
10 F-G	11 F-G	12 F-G	13 G	14 F-G	15 F	16 F-P
17 F-P	18 F-P	19 F-P	20 VP	21 VP	22 VP	23 P
24 P	25 F-P	26 F-P	27 F-P	28 F	29 F	30 F
31 F						

burns up high in the atmosphere (typically 65-70 miles), it leaves a momentary trail of highly ionized gas behind it, and if the geometry is right you can make short duration QSOs. Computer-aided high speed CW is the preferred method for making contacts and the VHF 2-meter and 6-meter bands are normally used, but there is a growing interest among hams on the 10-meter HF band as well.

Obviously there isn't enough room here to explain the ins and outs of meteor scatter DXing, but there has been much written on the subject. Two good sources of information that can be found on the Internet are the Web sites at [www.nr6ca.org/meteors] and [www.meteorscatter.net/ms].

73 until next month. Jim.

Band-by-band forecast

10-12 meters. Conditions will be only fair but you can expect seasonal improvements toward the end of the month. The best openings will generally be toward the southeast in the morning and to the southwest in the afternoon. As is typical during the summer months, the strongest and most reliable paths will be to Central and South America. Daytime short-skip will range from 1,000 to approximately 2,300 miles.

15-17 meters. Some decent openings should be available to Southern Europe and parts of Africa in the morning, Latin America in the early afternoon through mid-evening, and Australia or Southeast Asia from late afternoon up to midnight. On Good (G) days a single skip distance of up to 2,400 miles is possible, although the average is more likely to be somewhere between 1,000 and 1,800 miles. Moderate duration sporadic-E openings should also be fairly common throughout the month, especially if you work toward the east before local noon.

20 meters. Good daytime opportunities should be available throughout the month, with evening and nighttime conditions improving dramatically as September approaches. In the mean time, look for peak periods an hour or two after sunrise and again in the late afternoon. Europe and Africa should provide steady fare if you're situated in the eastern half of the U.S., while those west of the Mississippi will find that the South Pacific, Australia, and Indonesia will be more readily available. As always, the Caribbean and South America should be open to nearly everyone at most hours of the day and night. Short skip will be between 500 and 2,200 miles.

30-40 meters. Some weak worldwide openings are available from sunset to sunrise

on most days, but this is hurricane season so expect a lot of atmospheric noise much of the time. During the quieter periods, operators in the Central and Western U.S. should find some strong openings across the Pacific to New Zealand, Australia, and Indonesia, while those on the East Coast will find Western Europe and North Africa more accessible. Short-skip at night will range from 500 to 2,500 miles but will be limited to less than 1,000 miles during the day.

80-160 meters. Only fair worldwide opportunities will exist between sunset through sunrise on the quieter days, so don't expect much action here. If 40 meters seems to be doing well then some good opportunities may also be available on 80, but 160 will usually be buried in atmospheric noise. Look for peaks just after midnight and again just before sunrise. Daytime skip will be very short — under 250 miles — but nighttime skip can range from 1,000 to 2,000 miles. 73

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VU2FCX is Alex Fernandes, and VU2DM is Didier Jose Di Melo.

After two weeks of rambling on the Indian coast of the Arabian Sea, it was time to fly back to cold and dark Stockholm. Early morning, while queuing for the check-in counter at the Dabolim airport, I was approached by an officer holding a handheld radio. "Oh gosh," I said to myself, "some kind of trouble?"

The officer introduced himself — "I am VU2FCX, Alex." That was a very pleasant surprise and a wrap-up of my visit to Goa. Alex works at the airport of Dabolim, the same airport that Luis Catulo worked at more than 40 years ago. 73

THE DIGITAL PORT

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back and even the barest essential TV antenna had to be hidden from view even though the local cable would not be available there for several months.

What I am getting to is the fact digital has come along at an ideal time. Like most hams, I find great success with 20 to 30 watts. When I read the instructions for using the PSK63, it mentioned the need to boost the power. The first few tries were unsuccessful at 25 watts,

so I cranked up to 50 watts, but found that was not necessary.

As with most ham paths, it is only necessary to be in the right place at the right time. I found the other operators were enjoying success without extra power, so PSK63 follows the digital power norm.

What gets me riled is all the restrictions put in place that cause hams to build antennas in their attic or enclose them in a flag pole. And I am not sure what else is being used by to satisfy those who would mandate a pristine countryside for their residence.

Anyway, with that little bit of ranting done with, the real secret to ham success on HF lies in the use of the modes we discuss here. It is a wonder to me how, seemingly, so little notice is given in other publications and in most club activities of the great advantages of this technology (and did I mention Fun?)

We have the answer here, and I think it is because of the dedication of some really great programmers and a whole bunch of contributions from technically oriented hams.

That's it for this month. Keep those digital fires burning, 73 Jack KB7NO. 73

Q&A

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1. Cyclogenesis refers to?
 - a. the development of a warm front
 - b. the development of a high pressure system
 - c. the development of a low pressure system
 - d. fair weather
2. What is the average sea level pressure in millibars?
 - a. 925
 - b. 29.92
 - c. 101.1
 - d. 1013
3. What is vorticity?
 - a. force of the movement of the air
 - b. measure of the rotational spin at a point within a fluid
 - c. the rate of uplift of air
 - d. vertical stretching of a parcel of air
4. The most windy location in the U.S. based on average wind speed?
 - a. Mt. Washington, NH
 - b. St. Paul Island, AK
 - c. Cold Bay, AK
5. The National Weather Service is under what federal department?
 - a. Department of Interior
 - b. Department of Agriculture

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- c. Department of Defense
- d. Department of Commerce

- 6. The snowiest U.S. location based on annual average snowfall?
 - a. Mt. Washington, NH
 - b. Watertown, NY
 - c. Valdez, AK
 - d. Stampede Pass, WA

Answers to WX trivia questions: 1. c; 2. d; 3. b; 4. a; 5. d; 6. d.

Thanks to the Spring 2003 issue of Radiogram, published by the Capital City Repeater Association of Columbus, OH.

The Ever Changing Brain

If you have ever taken a taxi in a major city, you may have wondered how the taxi drivers know how to reach even the most obscure destination without a street map or a hint from their passengers. Well, a new study indicates cabbies are working their brains so hard that they become enlarged in the zone associated with navigation.

According to the study published in the journal *Proceedings of the National Academy of Sciences*, the drivers' brains adapted to help them store a detailed mental map of the city. This, by shrinking in one area to allow growth in another called the rear hippocampus.

In the latest study, researchers at University College, London University, compared the brains of 16 male taxi drivers with those of 50 other men of a similar age. They found that among the cabbies, the back of the hippocampus, the part of the brain associated with spatial memory, was larger than it was in the comparison group.

Scientists had previously reported differences in the structure of the brain between musicians and nonmusicians. Researchers say that evidence that the brain is physically able to change according to the way it is used could be important in understanding human development.

Thanks to Science Today, via Newsline, Bill Pasternak WA6ITF, editor.

RF Safety

Since we are now on the declining side of the sunspot cycle, the HF bands aren't quite as hot. The temptation to buy an amplifier to help out during these poorer band conditions is getting stronger. Several manufacturers make affordable amplifiers in the 500 to 700 watts range. That extra punch will help get your signal out, but there are other things to take into account before you fire it up.

Did you know that every time you fill out a form 605 to renew or upgrade your license, you certify that you are in compliance with the RF safety regulations? The line reads:

"I have read and WILL COMPLY with Section 97.13(c) of the Commission's Rules regarding 62 73 Amateur Radio Today • August 2003

RADIO FREQUENCY (RF) RADIATION SAFETY and the Amateur Service section of OST/OET Bulletin Number 65."

When you have time, read the full section, but right now I'll summarize the rule. It is available at [<http://www.arrl.org/FandES/field/regulations/news/part97/>]

97.13(c). In summary, it says: Before causing or allowing an amateur station to transmit from any place where the operation of the station could cause human exposure to RF electromagnetic fields ... (1) The licensee must perform the routine RF environmental evaluation ... (2) If the routine environmental evaluation indicates that the RF electromagnetic fields could exceed the limits ... in accessible areas, the licensee must take action to prevent human exposure to such RF electromagnetic fields ...

Think about your antenna installation. How far is it from your neighbor's property line? Do you have a fence around your yard to restrict people or animals from entering? Can you touch your antenna from the ground? Do you have children ... who play in the yard where your antenna is located? Does your neighbor have children who could wander into your yard while chasing a ball or playing games?

The rules talk about controlled and uncontrolled exposure. Controlled environments relate to those who know they are being exposed to RF. Your family usually knows when you are on your radio. Do the neighbors know they are being exposed to RF radiation? This is where the uncontrolled part is very important.

Let's use our club's 10-meter net frequency, 28.410 MHz, as an example. For simplicity, let's use 100 watts output into a dipole antenna. The formula shows that it is safe for a controlled environment at 5.76 feet and an uncontrolled environment at 12.82 feet.

Now, if you recalculate the same frequency with the power output from an amplifier at 500 watts, the new calculations show that a controlled environment is OK at 12.82 feet and uncontrolled at 28.61 feet.

Now, let's take the power up to the legal limit of 1500 watts: The controlled distance goes out to 22.18 feet and the uncontrolled is out to 49.52 feet. As you can see, the bigger the tower, the easier it is to comply with the regulations. But what if we don't have a big tower? Maybe we use a ground-mounted vertical on our city lot.

Don't let the math scare you away from doing the calculations. You can use a Web site found at [<http://n5xu.ae.utexas.edu/rfsafety/>]. This is a good site to plug in the numbers and find out how well your station complies. I recommend that you print out the results and put them in your logbook in case your neighbors have questions about RF safety. It will help satisfy their concerns when they see that you have done the calculations and have documented the safe operation of your station.

Thanks to Rick WOPC, via GARBLE, the monthly publication of the St. Charles Amateur Radio Club, Inc., April 2003.

NEVER SAY DIE

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their courses by explaining what their students are going to learn, and how this could possibly benefit them in life. Imagine the double talk when they try to rationalize teaching trig and the binomial theorem.

The music reading course made it easy for me to get involved with singing in a choir as a boy soprano, and going on to sing in bigger and better choruses. The art appreciation course was of enormous value to me when I started in television as a cameraman. It also made my pictures more interesting when I got involved with photography in high school, where I joined the camera club and spent many, many happy hours in the darkroom developing and printing my pictures.

The weekly music appreciation sessions at PS 99 in Brooklyn for the whole school helped my instinctual love of classical music grow. This was instrumental (sorry about that) in my getting started with my first major independent business, manufacturing hi-fi loudspeaker cabinets. And when the compact disc came along, my love of music made publishing *CD Review* great fun.

High school was a terrible bore, made bearable by the after school clubs ... there was a choice of 120 of 'em. I opted for the Savoyards, where we put on Gilbert & Sullivan operettas; the camera club; the radio club (W2ANU); and the book club. The Choral Club rehearsed every day, second period, and put on some exciting radio and public concerts.

While curriculum and textbook choices are in the hands of bureaucrats, it's unlikely that our school system will be results-oriented. When we change over to DVD-based programs, perhaps we'll see more courses aimed at educating kids to live and work better in the real world. No, not perhaps — it'll happen for sure.

More Mass Murder

What does it take to get you at least annoyed? The AMA, FDA, NIH, et al., all have to be well aware of the blood purifier (bioelectrifier) and the patents issued on this fast, inexpensive cure for AIDS, malaria, Lyme disease, and so on, that results when a tiny electric current is passed through the blood.

Like? How about 80,000 people died totally unnecessarily in Uganda last year from malaria ... half of them children. Or the 12 million AIDS deaths in sub-Saharan Africa last year. This is mass murder by secrecy to protect the pharmaceutical company's drug sales.

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Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$15 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively — once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories — where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6LJ, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 100 Editorial Essays: \$5 (#72)

1997 157 Editorial Essays: \$8 (#74)

1998 192 Editorial Essays: \$10 (#75)

1999 165 Editorial Essays: \$8 (#76)

2000 101 Editorial Essays: \$5 (#77)

2001 104 Editorial Essays: \$5 (#78)

Silver Wire: With two 5-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. \$15 (#80)

Colloid Reprint: April 97 article on a silver colloid maker, history, and how to use the stuff. \$5 (#98)

Colloid Clips: Three 9V battery clips, 2 alligator clips & instructions. \$5 (#99)

AC-powered Colloid Kit: 12V power supply, silver wires, reprint, including priority mail shipment. \$37 (#82)

Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry; Schools in 2020: another \$ trillion industry. Anthrax, a simple cure. Dowsing: why and how it works. \$3 (#86) My 1992 **We The People Declare War! On Our Lousy Government** book—360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need: **NASA Mooned America:** René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs — such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was \$7. I found a few in the warehouse. \$3, while they last. Great book! (#83)

Radio Bookshop

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Your e-mail address: _____

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost) — comes to 35 cents a word for individual (noncommercial) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the October 2003 classified ad section is August 10, 2003.

220 MHz Award; see W9CYT on WWW.QRZ.COM for information. BNB645

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NEVER SAY DIE

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Well, heck, what's a bunch of Africans, right? Big deal. If we don't kill millions of 'em with AIDS and malaria, we'll soon have another billion starving mouths to feed. Name one country in Africa where there is a government that gives the slightest damn about their people. I've only visited ten African countries so far, but that was enough to give me the sorry picture.

But please don't protest abortions while ignoring the massive carnage the FDA's blood purifier secrecy blanket is allowing to go on. Your government at work.

Up in Smoke

When Big Tobacco agreed to pay the 50 states \$246 billion over 25 years, the idea was for this money to be used to help educate teenagers about the stupidity of taking on a lifetime drug addiction and to help pay smokers' health care costs. Instead, the most of the \$21.3 billion paid so far has been used for pork barrel projects and tax cuts, with only about 5% going for smoking prevention. Gee, what a surprise.

The Centers for Disease Control & Prevention (CDC) gives 43 of the states failing grades on providing adequate tobacco education. I know I see lots of kids smoking as they walk by our front door, going home from the high school down the road.

SEPTEMBER 2003

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QRX . . .

AAADD

That's Age-Activated Attention Deficit Disorder to you, and here's how it goes ...

I decide to wash the car and start toward the garage, when I notice the mail on the table. I figure I might as well go through the mail before washing the car.

I lay my keys down on the desk, sort the mail and

discard the junk mail. As I discard the junk mail, I see that the garbage can is full.

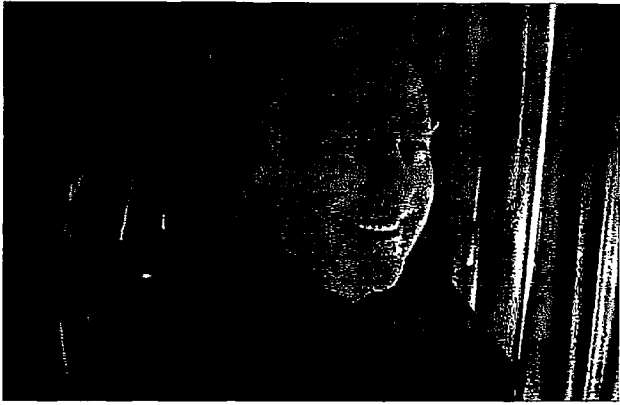
I lay the bills down on the desk and pick up the trash can. Then I figure that since I'll be going near the mailbox while taking out the trash, I may as well pay these few bills first. Now where did I put my checkbook?

Ah, here it is! Oops, there's only one check left. My extra checks are in the other room.

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Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article (IBM (ok) or Mac (preferred) formats), carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

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Wise Up & Beat the Odds

NEVER SAY DIE

Wayne Green W2NSD/1

w2nsd@aol.com
www.waynegrain.com

Begging Bowl

About once a year I get a League letter asking me to donate money. What I haven't seen in all these years of begging bowl rattling has been any productive use of the donated money. Now, is this just Wayne trashing the League again, or have I a legitimate gripe that you ought to think about?

The red flag waving for your money this time is BPL. No, not the Brass Pounder's League (RIP), it's Broadband over Power Line. Hmm, shouldn't that be BOPL?

This has to do with the public connecting to the Internet via the power lines instead of the telephone, cable or fiber optics. The benefit is a wide bandwidth being available, making possible the downloading of video and higher speed E-mail. With power lines already reaching every home and business, this is going to be a new technology that is going to be very difficult to stop. It'll have a lot of big bucks pushing it.

The fear is that the wide-band RF on power lines will interfere with weak signal reception on our HF bands, right on up to six meters. That does seem likely, though the League begging letter cited no tests giving data on the extent of the potential interference.

Okay, let's say that the letter, which was sent to the entire Callbook list, not just League members, pulls in a few million bucks in donations. What does the letter say they're going to do with the

money? "Everything possible," is the promise. Hey, I want something a little more tangible in the way of a plan. It looks to me as if we're talking about fighting a tsunami with a teacup.

Despite my griping, I haven't seen the slightest sign that the League has done anything visible about stopping our hobby's slow death. We need to get the word out to teens about the fun they're missing. Have you seen any orchestrated promotion efforts? Any increase in newspaper coverage of our hobby? Anything in any of the national magazines? Any move to get the Boy Scouts more involved? Anything on television? If you have, you sure haven't been letting me know about it, despite my nagging.

What I'm hearing when I tune the bands is the least QRM I've ever heard. Wide open spaces on our bands.

Yes, thirty years ago we gave the world cell phone technology ... now a huge industry with over two billion users. By the way, the League did virtually nothing to help us develop our repeater technology. Most of that promotion was done in 73 and my *Repeater Journal*.

The time was when we amateurs developed and pioneered most of the commercial communication technologies. Like FM, NFM, SSTV, and so on.

We have one more chance to make our hobby valuable to the country, and that's by getting into gear and developing QRP networks to help with Homeland Security. I

didn't see this even hinted at in the League letter. They just want the money to "fight" for us. I'd like to see some hint that they have a clue as to how to fight the Internet expansion via power lines.

Being an old-timer, and my Alzheimer's not quite kicked in yet, don't I sort of recollect an ado when it was discovered that a League president had spent big gobs of the League's funds designated for protecting our bands on a Caribbean vacation for him and his wife. Refresh me on the details. Oh, there I go "trashing the League again." Tsk, I just can't seem to help myself when they're so vulnerable.

So, K1ZZ (zzz?), what plans does the League have to stop Internet progress? Come on, 'fess up. Convince me that I'll benefit by sending money to Newington.

Two Newsletters Fold

The *W5YI Report*, which has been around for over 30 years, along with the *New RTTY Journal*, folded in July. I've never seen a copy of the *Journal*, so I don't know anything about it. The *Report* covered amateur radio, computing, and new electronic gadgets. Lotta work doing the research for that wide a field.

I started my publishing career with a monthly *RTTY Journal* in 1951. It started off mimeographed and graduated to a 36-page photo offset journal with over 2,000 paid subscribers. I ended it when I signed on as *CQ's* editor in January, 1955.

By January 1960, when *CQ* got to where I was owed a year's pay. I was canned ... with the publisher's promise that I'd eventually get paid. Let's see, \$15,000 at 10% per year interest for 43 years is ... around ... \$903,000. Hmm, with that I could launch my magazine to revolutionize our educational system.

The folding of two more amateur radio publications is indicative of the steadily decreasing interest in the hobby. With only about 25% of the licensed hams subscribing to any ham publication ... or showing any signs of being active ... these are not our greatest times.

I'd love to help light a fire and get things growing again, but I can't do it all alone. I've asked many times for letters from you about any exciting times you've had in the hobby. I'm still waiting for your letter.

I'd like to publish some such letters in 73 and then make them available in a booklet for clubs to use to reach out to youngsters and get them interested in more than ball games and the Internet. We have a great story to tell ... but no one is telling it.

Ticket to Ride

One thing that's been concerning me is when the FCC might wake up to the fact that the amateur radio "service" is no longer satisfying most of the reasons cited in our regulations for our being allocated a few billion dollars worth of frequencies. We're no longer

pioneering new technologies. We're no longer of the slightest interest to the military as operators in time of war. International friendships? Oh, sure. Well, we're still a handy source for emergency communications.

Hey, that's our ticket!

No matter by whom the 9/11 event was planned, the result has been an awakening of at least some of the public to how wide open we are to terrorist attacks. It's also provided the Bush League's excuse for invading Afghanistan and Iraq (so far). But, that's an agenda I suspect will read a lot differently in the history books than we're getting from today's media.

The Homeland Security people are going to need some sort of dependable grass roots communication system when the power's down and the cells go out. One that can be called into action with no notice and work flawlessly ... anywhere in the country. Hey, that should be us! And with a bunch of bazillions being thrown at security problems, maybe we should have our nets out.

Okay, what kind of service can we provide? Our gear will have to be emergency-powered, so we're talking just a few watts. Our antennas will have to be simple ... maybe a long wire put up with a bow and arrow or a sling. We want to use fixed frequencies so we don't have to tune around. We'll eventually want to be able to zip messages through at high speed, including pictures, so we're not talking CW ... or even voice for most throughput. So we're talking computers and special software. Well, that's next year ... this year let's get started with voice.

We have a few hundred active ham clubs, each with a few dozen members. We're going to want to activate thousands of clubs, each with a hundred or so members, so that means either bringing the 500,000 licensed, but inactive, hams back to life, or getting busy recruiting some new (young) blood. Better yet, both.

We're going to need 500,000 Emergency Radio Amateur Homeland Security rigs. Will we make 'em here, or farm the job out to China or Bangladesh? At \$500 each, that comes to \$25 million. A pittance.

It's brainstorming time, so what do you think we'll need? Maybe each club should have an emergency coordinating van to tie the club members together. Plus it could coordinate as a hub with other communication services such as doctors, police, fire, sheriffs, FEMA, Homeland Security, military, etc. An independently powered repeater (solar?) will be important. What do you think?

Iraq

With the evaporation of Iraq's WMDs we're left with oil as the prime mover for our invasion. But I wish the Bush League had done a little post-war planning. Like maybe not throwing 400,000 Iraqis out of work when we in one day closed down the armed forces, several security groups, and the defense and information ministries. Out of work with no jobs or unemployment payments available. So much for winning the hearts and minds in Iraq.

More 9/11 Questions

There's that large flurry of short selling airline stocks just before 9/11 which has quietly faded from visibility. There's no way the people who did it could hide, so why the silence?

And how did the Administration manage to whip up that 360-page Patriot Bill in so few days? They must have had that ready to go and then fast-track zipped it through Congress. It crushed a whole bunch of our freedoms, making the conspiracy one-world crowd more believable.

Pearl Harbor stank sixty years ago and 9/11 is already smelling bad. There are too many unanswered questions ... and we know the media can't be trusted to tell us the truth. It's a shame when

honest reporters have to write a book like *Into The Buzzsaw* in order to get the truth the government wants covered up out in the open. The way I see it is that ABC, CBS, NBC, et al., are government and industry puppets. Ditto the *New York Times* and other major newspapers.

Infamy

Being a very, very old person, I was listening in 1941 when Roosevelt made his "Day which will live in infamy" speech. Of course there were the usual conspiracy theorists who started asking questions about who knew what when. But it wasn't until recently, when Stinnet hit us with *Day of Infamy*, that even the sports-page readers became aware of the depth of the secrecy and lying surrounding the Japanese attack of Pearl Harbor.

So I was surprised when at the Peterborough dump I found a paperback copy of *Infamy - Pearl Harbor and Its Aftermath*, by John Toland, dated 1982. Even twenty years ago he had the goods on Roosevelt. This 400-page book is well documented.

You know the part that is most discouraging about finding this book? That not one of my 73 readers ever mentioned it to me.

College News

Two items about my old alma Rensselaer Polytechnic Institute (RPI) made the news. One had to do with the sudden closing down of their School of Architecture, leaving 50 students stranded, the only college to do so. The other was a \$12,000 fine for students being caught illegally downloading music. Not exactly the kind of PR they wanted.

Instant Alzheimer's

Are you still taking a medication? A letter from Betty Merritt might be almost enough to get you thinking. Well, maybe not. It had to do with her father, who had had high blood pressure. He went

through five different prescribed medications. Each gave him a rash and caused him to become confused. When he stopped the rashes went away and he'd get his mind back.

Then his doctor prescribed Toprol. Her dad took half a pill before going to bed. The next morning the rash was back and he was so confused he couldn't even dial a phone. This time the memory loss was permanent.

A *Time* magazine article pointed out that blood pressure and anesthetic medications are the worst on the brain. The article said the memory might come back after as long as five years. No wonder we have so many Alzheimer's patients in nursing homes.

Cancer Cure

Acres USA had a most interesting article about George Earl-Thomas, a chap who moved here from New Zealand in the early 1900s. He was an early microbiologist. In the 1930s he began using his discoveries to treat cancer patients with the trace minerals, which even then were long gone out of our processed food ... with a 60% success rate! The medical industry today only has a 7% survival rate for cancer. WWII stopped his work, but he continued after the war... until the FDA took him to court in 1948 for providing "medical advice" without a license. He fought back in court and won! But, as he was leaving the court the FDA Deputy Director who had led the fight asked him if he intended to continue to send out his literature on electrolytes and cancer. He said, "Of course." A few weeks later his lab was burned to the ground, along with all of his data and notes. George gave up.

Well, at least the FDA didn't burn his books, trash his research lab, and put him in prison, like they did Wilhelm Reich (whose orgone therapy was working miracles). Reich

Continued on page 9

continued from page 1

Oh! There's the soda I was drinking earlier! Hmmm, I guess I'd better take it out to the kitchen and discard it.

On the way to the kitchen, my flower arrangement catches my eye and I realize it needs more water. I pour the soda down the sink.

As I wipe a spot off the counter I see my glasses on the windowsill. It's about time. I've been looking for them all morning!

I guess I'd better go put them away so I can find them again later. But first I've got to add water to the flower arrangement ...

Hey! What's the TV remote doing in the kitchen? Aaaaagh! I'd better take it to the living room, because we'll never think to look for it in the kitchen tonight.

I take the remote out to the coffee table and find that the living room is a bit untidy, so I go around arranging cushions and throw pillows.

Then I'm off down the hall, to... to... what the heck was I planning to do?

End of day: The car isn't washed, the bills are unpaid, the flowers aren't watered, the checkbook still only has one check, and now I can't seem to find my car keys! I don't seem to have gotten anything done today, but I just can't figure out why because I KNOW I WAS BUSY ALL DAY LONG!!!

I realize this is a serious condition and that I'd better seek help. But first, I think I'll check my e-mail.

Thanks to whoever is the author of this article on AAADD and to the folks who sent it to us through the Internet.

DXpedition, Texas-Style

When we moved to Friendswood, TX, in 1980, we looked for a home. It had to be a special location, big yard, not too close to the neighbors, and in a subdivision where the deed restrictions had already been broken for ham antennas. Luckily we found such a home, and to our joy a bunch of hams already lived in the area. We formed a club, The Forest Bend Amateur Radio Club. We were a bunch of husband/wives, all hams. We went on picnics, to conventions, and for Saturday breakfast together.

At one breakfast we got to talking about DXpeditions and how we would love to go on one. None of us had the time or money for a real one but the more we talked, the more we got to planning a mini one. Where to go? Galveston Island, on the Texas Coast, was only 40 miles away but too populated. Then someone suggested Pelican Island.

Pelican Island is a small island between Galveston and the mainland. Many years ago it was an immigration station where new arrivals were brought off ships sort of like Ellis Island in New York. Later the immigration station was

closed down and a park was established. A large, three-story building was built for parties, a fishing pier went out over the Bay, and a submarine was placed for visitors. We received permission to use the island.

We called the FCC in Houston to ask permission to use the prefix /P1 after our call. They said no problem as long as it wasn't an existing prefix. We took my "Old Man's" two-letter call, W5RK, and W5RK/P1 was born. Our IOTA was NA143.

We were fortunate that two of our hams had RVs and were able to park them far enough apart so they would cause a minimum amount of interference between the various harmonic-related bands. We mounted a Moseley 3-element beam on one RV and on the other a vertical.

On the building which housed several operating positions, we had another 3-element beam and a number of wire dipoles running down toward the water. These were 40- and 80-meter antennas. The transceivers consisted of two Kenwood TS-930s, two TS-830s, and a TR-7.

You can imagine the bedlam when we put out our first CO and signed de W5RK/P1. It was almost impossible to pick out one call from the other. All in all, between us we made several thousand contacts (SSB and CW). It was an enjoyable weekend despite the fact that we operated during the entire time, day and night. Sunday evening we took everything down and headed home — feeling the joy and accomplishment, but dead tired. I designed a special QSL card. I only wish I had one left to show here, but unfortunately they were all gobbled up, right to the last card.

It was a big success, with everyone calling us and asking, "Where is Pelican Island?" Hams from all over figured some new mysterious island had suddenly sprung up. When we identified it as off the Texas coast we all got a big laugh, but everyone was tickled with our DXpedition. Even at future conventions we had hams contact us and ask about our mini-DXpedition.

Thanks to Renell Levin WB5VBP, 100 Texas Ave. W #1016, Webster TX 77598; [olevin@wt.net].

The English Language — Easy or Hard?

Eleven more reasons why the English language is so hard to learn:

- 1) The insurance was invalid for the invalid.
- 2) There was a row among the oarsmen about how to row.
- 3) They were too close to the door to close it.
- 4) The buck does funny things when the does are present.
- 5) A seamstress and a sewer fell down into a sewer line.
- 6) To help with planting, the farmer taught his sow to sow.

- 7) The wind was too strong to wind the sail.
- 8) After a number of injections my jaw got number.
- 9) Upon seeing the tear in the painting I shed a tear.
- 10) I had to subject the subject to a series of tests.
- 11) How can I intimate this to my most intimate friend?

Thanks to The Modulator, April 2003.

New Company Rules

For SICK DAYS: We will no longer accept a doctor statement as proof of sickness. If you are able to go to the doctor, you are able to come to work.

SURGERY: Operations are now banned. As long as you are an employee here, you need all your organs. You should not consider removing anything. We hired you intact. To have something removed constitutes a breach of contract.

PERSONAL DAYS: Each employee will receive 104 personal days a year. They are called Saturday and Sunday.

VACATION DAYS: All employees will take their vacation at the same time every year. The vacation days are as follows: Jan. 1, July 4, Dec. 25.

BEREAVEMENT LEAVE: This is no excuse for missing work. There is nothing you can do for dead friends, relatives, or coworkers. Every effort should be made to have non-employees attend to the arrangements. In rare cases where employee involvement is necessary, the funeral should be scheduled in the late afternoon. We will be glad to allow you to work through your lunch hour and subsequently leave one hour early, provided your share of the work is done.

OUT FROM YOUR OWN DEATH: This will be accepted as an excuse. However, we require at least two weeks' notice, as it is your duty to train your own replacement.

RESTROOM USE: Entirely too much time is being spent in the restroom. In the future, we will follow the practice of going in alphabetical order. For instance, all employees whose names begin with A will go from 8:00 to 8:20, employees whose names begin with B will go from 8:20 to 8:40, and so on. If you're unable to go at your allotted time, it will be necessary to wait until the next day when your turn comes again. In extreme emergencies employees may swap their time with a coworker. Both employees' supervisors must approve this exchange in writing. In addition, there is now a strict 3-minute time limit in the stalls. At the end of 3 minutes, an alarm will sound, the toilet paper roll will retract, the stall door will open, and the seat will eject you.

DRESS CODE: It is advised that you come to work dressed according to your salary. If we see you wearing \$350 Prada sneakers and carrying a \$600 Gucci bag, we assume you are doing well financially and therefore you do not need a raise.

LUNCH BREAK: Skinny people get an hour for lunch, as they need to eat more so that they can look healthy; normal-size people get 30 minutes for lunch, to get a balanced meal to maintain the average figure; fat people get 5 minutes for lunch because that's all the time needed to drink a Slim Fast and take a diet pill.

Thank you for your loyalty to our company. We are here to provide a positive employment experience. Therefore, all questions, comments, concerns, complaints, frustrations, irritations, aggravations, insinuations, allegations, accusations, contemplations, consternations, or other input should be directed elsewhere — in triple quadruplicate.

Have a nice week.

— The Management

Thanks to the L'Anse Creuse Amateur Radio Club's Tuned Circuit, April 2003.

Where Record Speeds Came From

Ever wonder why the first successful disk phonograph records ran at 78 revolutions per minute? Well, a posting to one of the audiophile remailers explains it this way.

Up until the 1920s, recordings were made at a variety of speeds from 75 rpm to 84 rpm, and sometimes outside this range. The minimum acceptable speed was governed by the quality of the sound from the innermost grooves of the record. By trial and error this speed was found to be around 78 to 80 rpm.

The speed of records is based on the American electricity AC standard of 60 hertz. When engineers wanted to standardize the speed of recording equipment in the studios they started using synchronous electric motors. These are motors that are locked on to the 60 hertz power and run at precisely 3600 rpm.

If you use simple gear ratios, then 3600 divided by 46 is 78.26 rpm. And all other phonograph record speeds came from the same source as well. 3600 divided by 80 gave us the popular 45 rpm record that helped to make the rock 'n' roll revolution. 3600 divided by 108 is responsible for the LP 33-1/3 rpm record; dividing by 216 made the somewhat rare 16-2/3 rpm disks.

Of course, most vinyl albums have been replaced by digital compact disks, but the history of grooved disks is an interesting one, and now you know how it all came about.

Thanks to The Hi-Fi Remailer, via Newsline, Bill Pasternak WA6ITF, editor.

Do You Remember ...?

Little glass Coke-shaped bottles with colored sugar water?

Television broadcasting that stopped at midnight?

Soda pop machines that dispensed bottles?

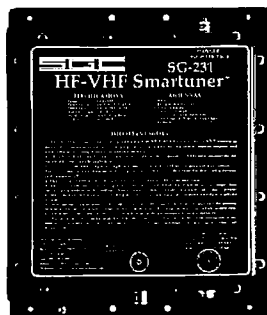
Hamburger joints with tableside jukeboxes?

Continued on page 58



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LETTERS

From the Ham Shack

Orlo Hudson W5LVA. I am a lifetime subscriber since the '60s — the best \$73 I ever spent. I have been licensed since 1941, but they had Pearl Harbor and I could not get a station license. After the shooting was over, I asked for a license and the Army issued my German call letters. I corrected this as soon as I got home. By then I had had the Operator's License for over a year and was eligible for a Class A license in my home town of San Antonio — hence the W5 call, which I still have. I got the best they had to offer at that time, and as a matter of principle — I will never "upgrade."

I got in the Army as a 17-1/2-year-old volunteer, but if I had known what I know now, they would never get me except by draft — and I would likely move to Canada in that case!

The reason that I am writing is that you have been supporting the idea that "NASA mooned us" for some time. It suddenly occurred to me that you are absolutely correct, and I can probably provide just the evidence needed to prove the case!

I would have to look at my resume to provide exact dates, and in my many boxes of records to provide numerical details, but if anyone wants to pursue it, we will be happy to do it! A summary follows:

In the early '60s, I was hired from North American Aviation by NASA in Huntsville, AL, and von Braun's "Paper Clip 100" as a Senior Staff Scientist for the Apollo Program. (I have a Ph.D. in physics.) I was put

in charge of "Lunar Surface and Subsurface Probes." Essentially my job was to go out for bids to aerospace companies and to evaluate the results.

I did not care for the suggestions made by the contractors for measuring lunar gravity, so I invented the Laser Absolute Gravimeter. The patent application sat on my boss's desk for 18 months w/o action, so I wrote a memo asking that if NASA were not interested, would they give the "rights" to me. In six months, I had a NASA patent in hand and funds to build a model. The Patent Number is 3,500,688. I am the sole inventor and NASA is the owner.

I was at the Cape to see the equipment launched, and then told that I had done my job and I was reassigned to something else. After about a year I was fired for "inefficiency."

It is clear to me now that they did not want me asking questions like, "Where is my data?"

At the time I thought I was fired because the paper clip bunch did not like me: I read, write, and speak German, and they knew that I regarded them as traitors to their country of Germany.

Now I think it was simply part of the "cover-up."

Anyone who wants to look into this will get my fullest cooperation, and they are welcome to view my "201 File" under the Freedom of Information Act. Of course, that doesn't mean you will get anything they don't want you to have!

If any of this is of interest to any nongovernment investigators, then I would give them my fullest cooperation.

At the time, I thought NASA was the biggest bunch of crooks that I ever encountered.

Bob W2IK. I thought you might like to look at my two ham Web pages ... real ham radio and real ham radio pg2. I have recently moved to Texas, from Long Island. My pages will change every six weeks or so, and my WTC 9/11 series will embarrass the League, who portrayed themselves as saviors when they weren't near any action and their local officials scrambled to get into Brooklyn when it was picture-taking time. They physically pushed the real ops out of the way so they could get their pix with the League prez!

The "ham of the year" wasn't even in NYC, he was at home in Babylon. What a farce! When confronted by me, the guy who spent the first 3 days at Ground Zero, they "neglected" to say anything about what nonmembers did. The Hudson Director put a small piece in his [www.hudson.arrl.org/beacon/november2001]. I have never met such a pack of self-serving people in my life. Makes me glad to now be in Texas.

It's not nice to speak ill of the dying. — Wayne.

Stuart Morrison K4BOV. Found some QSL cards I thought were lost more than 20 years ago. A gaggle of memories for sure. I had a couple of QSOs with you during my Navy days — did 20 years in the Naval Security Group. Your QSL card popped out while looking thru approximately 1200 cards I received while serving on Midway Island in the '60s. You are holding a pair of your favorite K-9's in the photo on the card. At that time, Midway was a separate country for the many awards offered to DXers. During the first year on Midway, I was the only ham and in real demand, not only by those wanting QSL cards, but also by the people on the island itself who were in constant need of phone patches. There was no other means of communication off the island unless there was a real emergency. Then, you might be eligible for a Navy E message — sort of like a telegram. Time catches us all. In the past few hours, I've already found that dozens of those QSL card owners have been lost to the ages. Some, I knew of their passing before finding the cards, as they were celebrated and world-renowned figures who have since passed thru the gates. Since many of us in Naval Communications were hams, it is understandable that we enjoyed and found interest in the various amateur radio publications of the period. Your 73 became the only periodical I looked forward to receiving. This was mainly due to the nonstuffed-shirt prattle you gave us in your editorials. Your monthly observations kept us in tune with what was going and what should be going on. I've got all the issues from the 1960 opening show.

Reminds me of when I visited VK6RU in Perth in 1966 and he pulled a 1946 card of mine out to show me. — Wayne.

Watch for these articles in future issues of 73 Magazine!

N8TD — Vibroplex Meets eBay

N1FN — Review of SCAF-1

AA2JZ — Surviving the "Dry Spell"

WA2OKZ — Using the Palm PDA

WA2OKZ — Setting Up Your Shack

WB9YBM — To Catch A Thief

NEVER SAY DIE

continued from page 5

soon mysteriously died in prison. Messing with the medical-pharmaceutical complex can be dangerous.

More Fluoride Info

Fluoride toothpaste and sodium fluoride in our water to help prevent cavities is just one more lie we've been fed. Well, it's resulting in less than 100,000 cancer deaths a year, so it's no big deal. How's it causing cancer deaths? Sodium fluoride inhibits the body's enzyme functions, knocking the immune system down. In heavier concentrations it's used as rat poison, where it causes the rats to starve to death, no matter how much they eat.

But, what about the cavities? When you start digging into the data you find that there has never been any research which has shown that sodium fluoride helps prevent cavities. Indeed, Toronto has had fluoridated water for over 36 years and they have far more cavities per person than Vancouver, which has no fluoride. The fact is that fluoridated water helps cause tooth decay. It also increases the aging process and causes birth defects in pregnant women. Deaths in fluoridated areas are 5% higher than in non-fluoridated ones.

Fluoride eats away the bones, causing them to become brittle and break more easily.

If a statue in the park of a person on a horse has both front legs in the air, the person died in battle. If the horse has one front leg in the air the person died as a result of wounds received in battle. If the horse has all four legs on the ground, the person died of natural causes.

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When you or your child uses fluoridated toothpaste 80% of the fluoride is absorbed sub-lingually within a minute unless it is spit out. No child should be allowed to use fluoridated toothpaste or to drink fluoridated water.

Classic Coke was tested and found to have 2.56 ppm of sodium fluoride. Diet Coke had 2.96 ppm. In fact it's found in most bottled drinks and drinks from concentrate because the country's bottling plants use fluoridated city water. Federal law does not require this to be disclosed on the label.

Cramps

My thanks to Harry Greulich WA6IWZ for a clipping on curing cramps. Take potassium.

I occasionally jump out of bed at night to stop a leg cramp. I've had foot cramps, even finger cramps. Which puzzled me, because I'm pretty healthy. Apparently eating one banana a day isn't giving me enough potassium, so I'll invest in a bottle of 550 mg potassium gluconate pills and see if they help (three a day, it says). And eat another banana.

Cutting Edge

One of my readers says he's making \$15 to \$20 an hour sharpening knives. He's a meat cutter in a super market, so he knows how important a really sharp knife can be for that work. Sez he knows a lady in a city who's making \$100,000 a year sharpening knives. I thought you might like to know.

When I was a youngster in Brooklyn (NY) a man came around every few weeks with a horse-drawn cart sharpening knives. He eventually graduated to a truck. Every household has knives that need sharpening.

If you're interested look into Ben Dale's EdgePro sharpeners ... 541-387-2222. It might be good for some spare-time cash. Ben's got a \$130 model and a \$340 professional model.

Anthrax Cover-Up

Less than a month after the 9/11 attack our media flooded us with the anthrax scare. Considering that both of

Continued on page 58

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Just Hang 'er Up

Clear out your closets with this fun WARC triband dipole.

Many of us have a fairly functional antenna farm. In my case, it is more like an antenna garden in relation to the size. Well, not really a garden. My XYL would surely take exception to that description! She thinks that gardens should have some sort of eye appeal. Why, sure there is eye appeal. Just looking out across the back yard beyond the tower with tribander and dipoles, you can see trees, clouds and sky. There is something for the eye of each beholder.

Regardless of the number of radiators on your "farm," there is almost always another band or two that could be added. This article may help in adding more bands — with fewer antennas and feedlines — to your aerial maze and do it simply and inexpensively.

One object stretched across the scenic view of my "garden" is a three-band sloping dipole. It is basically three dipole antennas fed with one common coax cable and designed to operate on 12, 17, and 30 meters. These three bands are sometimes referred to as the WARC bands. I picked these three bands for a design because I already had a triband

yagi for 10, 15, and 20 meters and dipoles for 40, 80, and 160 meters. I didn't want three more coax cables but I did want to operate on the three WARC bands.

A triband dipole fed with a single feedline is not a new concept. I have built multiband antennas in the past. They all worked very well, but with a couple of disadvantages. Drawback number one for this type of antenna is that they have several leg ends to anchor. Drawback number two is the possibility of the wires becoming entangled. For some time I pondered the idea of building a better WARC triband dipole that did not have these two drawbacks.

During a lull in the sunspot activity and on a weekend when there were no contests and/or local hamfests, I went shopping with the XYL. We went to a local discount department store. While she looked for some necessary household items, I looked for items to enhance the back yard and "garden." I found something that I believed could be used to build a better WARC antenna. This "fabulous find" was a dozen black plastic tubular clothes hangers for ninety-nine cents. I bought two dozen. I couldn't wait to get them home and start on my new project for the "garden." See Fig. 1.

I wanted to use the hangers as spacers

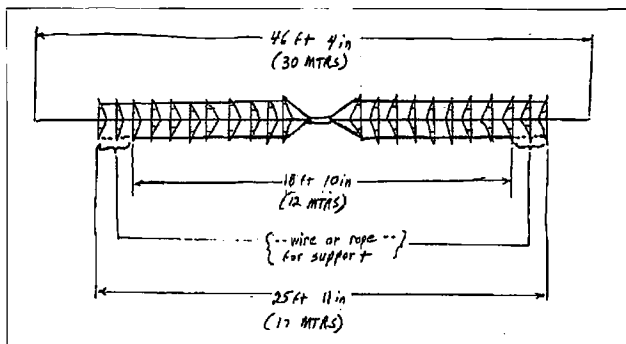


Fig. 1. This is the configuration for the tubular clothes hangers that I used as spacers.

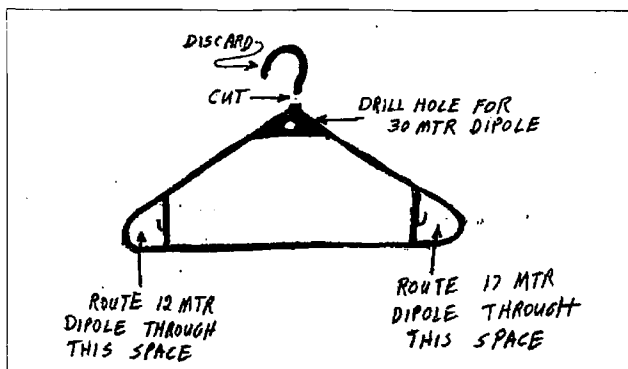


Fig. 2. Preparation details for clothes hangers.

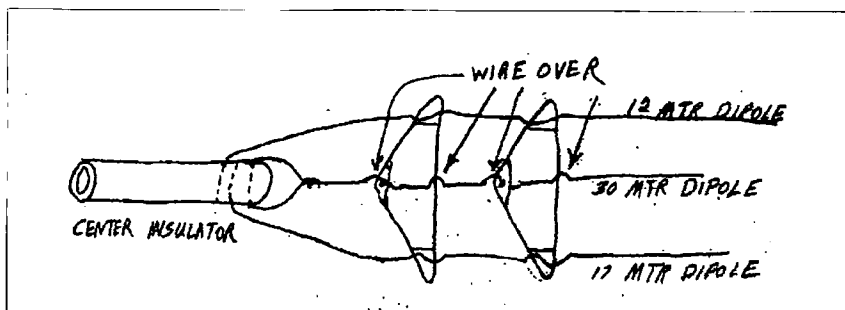


Fig. 3. Wiring detail for clothes hangers.

to separate the legs of the three-band dipole to be fed with a single coax. See Fig. 2 for details. I drilled holes in the thin plastic tab at the apex of the hanger triangle using a drill bit that was only slightly larger than the wire to be used for the dipole legs. Next, heavy wire cutters were used to snip off the hanger hooks. They could have been left intact and possibly used in the construction. I decided to cut them off to help disguise the real identity of the hangers. So far, all observers have identified them for what they really are. Oh, well, no big deal! You may wish to leave them intact if you decide to construct this antenna. The beauty of a simple project like this is that it can be modified to suit your own needs. You may want to add more bands or build it for different frequencies.

Twenty-two of the hangers were prepared as shown in Fig. 2. Eleven were used on each side of the center insulator. Be sure to purchase the hangers

with the reinforcement rods that run between the top and bottom at both ends. Try to find hangers of a dark color because they are not nearly as conspicuous as the white ones.

If a commercially made insulator is not available, you may want to consider making your own. A center insulator can be fabricated using a scrap of PVC pipe. Any diameter in the range of one to three inches, and cut to any length between four and seven inches, will work. Drill holes to accommodate the attachment of wires and you are in business. See Fig. 4.

The next task is to cut the 30-meter legs of the dipole to size. Being the longest, they will be used as the suspending elements. Almost any type of wire that is large enough to hold the weight of the completed antenna will do. Use your imagination and anything you have lying around the shop or garage. I used zip cord — the kind made to replace lamp and small appliance

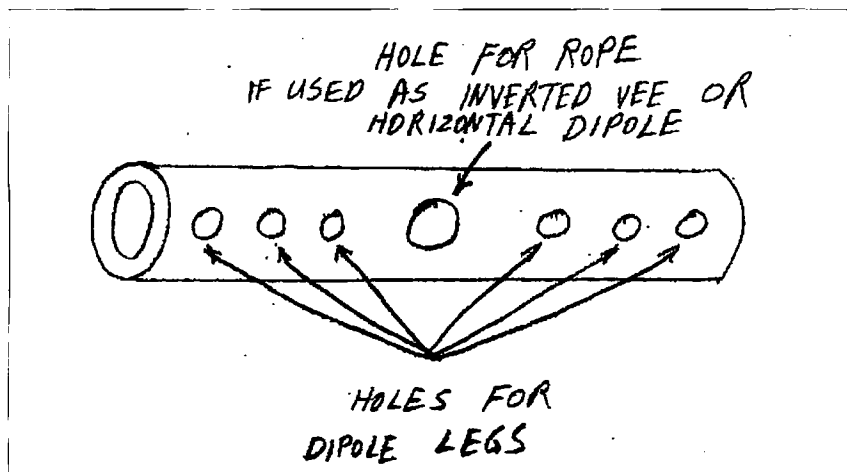


Fig. 4. Center insulator. The larger center hole is for rope, if used as an inverted vee or a horizontal dipole. The three smaller holes on each side of the center hole are for the dipole legs.

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Photo A. WARC dipole under construction, suspended three feet above ground.

cords. I separated it into single conductors. It is economical and durable.

I employed the formula for cutting a halfwave 30-meter dipole and calculated that 468 divided by 10.1 MHz equals 46.33 or 46 and one-third feet.

You should probably round this length up to at least 47 feet. This will make up for tying off and trimming for resonance later on.

Now, cut the 47-foot length into two pieces to make two 23-1/2 foot legs.

Tie the end of one of the pieces to the center insulator. Leave enough loose on this end to trim and solder. Push the other end of the same piece through the hole you earlier drilled in the tab of one of the plastic hangers. To do this, turn the hanger down horizontally. Place the apex (where the loop was, and the tab with the drilled hole is) to your left. From left to right, push the wire down through the hole, then pull it up and over the bottom of the hanger. See Fig. 3.

Continue this procedure through ten more hanger/

spacers. For starters, you can space approximately seven inches between them. You should have a few feet of wire extending beyond the last spacer after you have finished threading the 30-meter wire. Spacers are not required for the full length because the 17- and 12-meter dipoles will be shorter. Follow the same method to construct the opposite leg.

After completion of the 30-meter dipole, tie each end of the dipole to trees or structures to suspend it approximately three to five feet above the ground. This is a good working height. At this point the spacers may be uneven along the wire and a little tangled. Straighten them as much as possible at this time. The addition of subsequent legs will help to align them better.

The next step is to cut the halfwave dipole sections for 17 and 12 meters. The calculation for 17 meters equals 25.9 feet, with 18.48 feet for 12 meters. Cut them a little longer for trimming and tuning later. Cut these half wavelengths into two pieces each to create the quarterwave legs. Tie the 17-meter pieces to the center insulator in preparation for feeding through the hanger/spacers. Feed the wire between the reinforcement rods and ends through all 11 spacers as shown in Fig. 3. After feeding the wire from the center insulator and through the hangers, the end of the wire should be close to the eleventh hanger from the center insulator. Adjust the spacing on all the hangers equally and space the eleventh to accommodate tying the 17-meter leg to it. Repeat this action on the opposite leg.

The 12-meter legs should be added using the same method by running the wires between the reinforcement rods and ends at the opposite corner of the hangers. They should terminate at the ninth spacers from the center. After attaching the end, cut a piece of wire, twine, or rope to fit between hangers nine, ten, and eleven to stabilize them as shown in Fig. 1. Check the SWR on each band and trim as needed to obtain resonance and lowest SWR. Tuning is

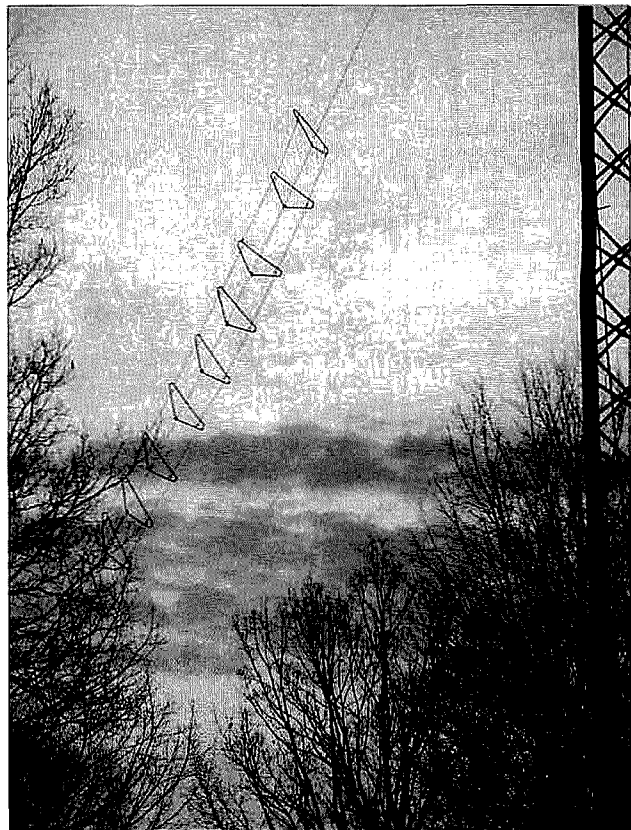


Photo B. Upper half of WARC dipole with lower half blending into the landscape.

Portable Pulse Generator

Build this pocket-size test instrument that's useful in a wide variety of lab and service tasks.

As new laboratory techniques are worked out and new circuits developed, the need for specialized test equipment rapidly changes. "Special" equipment often becomes "standard." For example, pulse generators, once found only in the larger laboratories, are gradually coming to be considered as "standard" pieces of test equipment for all labs. In some cases, pulse generators are used as much as oscilloscopes and VTVMs — "standard" equipment items of long standing.

Most pulse generators are characterized by their large physical size and their voracious appetite for electrical power. Not so, the instrument shown here. Although it delivers either positive- or negative-going pulses over a wide frequency range (100 to 6000 pulses per second), other ranges are easily obtained. With good output amplitude (12–18 volts peak across a 10,000 ohm load), the overall case size is only 3 x 4 x 5 inches and the power requirements are so small that it is practical to power it with two self-contained 9 V batteries.

In addition to its small size and low power requirements, the instrument shown has many other advantages. Highly efficient, it doesn't generate large quantities of surplus heat to increase the discomfort in a crowded lab or workshop. Light in weight and quite rugged, the instrument is ideally suited for portable and field work. It may, literally, be "slipped in an overcoat pocket."

The instrument shown also has the advantage of requiring neither "warm-up" time nor stand-by power. It is ready to use as soon as the power switch is thrown "on."

All these features have been made possible by designing the unit around the highly efficient 2N2222A. Standard, commercially available components are used throughout, and the circuit is sufficiently simple so that the average technician should have little or no difficulty in building a similar or duplicate unit in one or two days.

Circuit description

Basically, this pocket-size pulse generator consists of one transistor connected as a blocking oscillator, followed by a second transistor serving both as a clipper and as a buffer-amplifier.

Referring to the schematic diagram of **Fig. 1**, the first 2N2222A transistor is connected in a grounded emitter blocking oscillator circuit, with transformer T1 providing the necessary energy feedback to start and sustain oscillation.

A step-down turns ratio is provided to match the high collector circuit impedance to the low input impedance of the base-emitter circuit.

In operation, the "blocking" action occurs through the rapid charge of capacitor C1 through the base emitter circuit of the transistor and the secondary

of transformer T1, and the gradual discharge of this capacitor through resistors R1 and R2. The blocking rate is determined essentially by the RC time constant of the circuit made up of components C1, R1, and R2.

By making R1 adjustable, the circuit time constant and hence the blocking rate can be changed. Resistor R1 thus serves as the "pulse rate" control.

Resistor R2 is provided to limit the maximum blocking frequency and to protect the transistor from overload.

A signal is obtained from the blocking oscillator stage by means of a tap on T1 and is applied, through coupling capacitor C2, to the base of the second transistor, which serves to shape and amplify it.

An SPDT toggle switch, S1, is provided to change the bias current of the second 2N2222A stage, and thus its mode of operation. When this switch is open, the stage operates with zero bias, since the base resistor R4 is returned directly to the emitter of the transistor.

Under these conditions the stage acts to limit or clip the positive-going transition and to amplify and shape the negative-going portions of the applied signal. The amplified signal appears

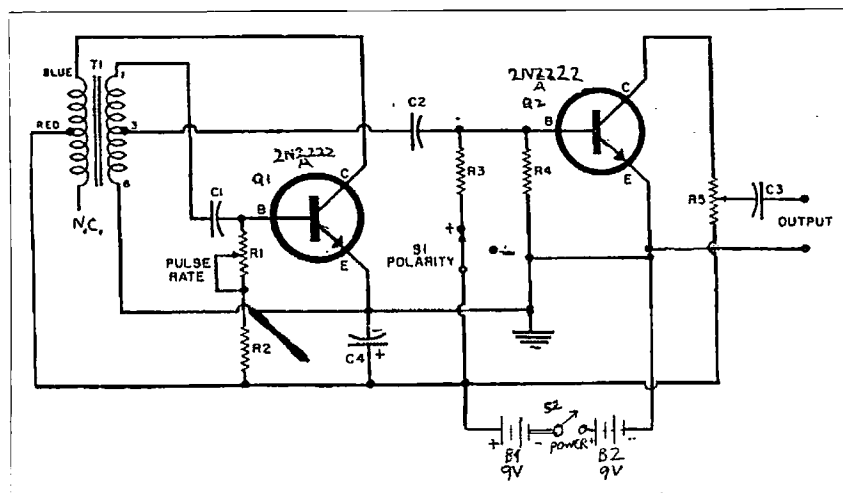


Fig. 1. Schematic.

across load resistor R5, but with positive polarity, due to the phase reversal of the stage.

By using a potentiometer for resistor R5, this resistor serves not only as the load resistor for the output clipper-amplifier but also as the output level control. The output signal is obtained through blocking capacitor C3, with its amplitude dependent on the setting of R5.

When switch S1 is thrown to its closed position, resistor R3 is connected between the base of the transistor and the negative side of the power source, thus permitting a heavy base bias current to flow. This radical shift in bias, in turn, modifies the operating characteristics of the stage so that the negative-going portions of the applied signal are clipped and the positive-going portions are shaped and amplified. This results in pulses of negative polarity appearing across load resistor R5; S1 thus serves as the pulse polarity switch.

Power is supplied by two 9 V

transistor-type batteries. B1 and B2 is controlled by an SPST toggle switch, S2 serving as the power switch. Capacitor C4 is provided to ensure a low impedance across the power source.

Output signal waveforms

The waveform of the output pulses obtained from my model are given in Fig. 2. The signals obtained from another unit should appear similar to these, but may not be exact duplicates.

A low-frequency (approximately 200 pps, pulses-per-second) positive-going pulse is shown in Fig. 2A and a high frequency (about 6000 PPS) positive-going pulse in Fig. 2B. As can be readily observed by comparing these two illustrations, the pulsewidth remains relatively constant. It appears narrower in Fig. 2A because of the lower repetition rate. The pulsewidth depends primarily on the characteristics of transformer T1 in the blocking oscillator stage.

When the polarity switch S1 is

thrown so that negative-going output pulses are obtained, the shaping action of the output 2N2222A stage is not quite as good, so that the negative-going pulses are not quite as sharp as the positive-going pulses. Nonetheless, they are quite satisfactory for most practical work.

Typical high-frequency negative-going pulses (about 6000 pps) are illustrated in Fig. 2C.

The maximum amplitude of the output pulse is approximately equal to the voltage of the power supply battery B1 and B2, because the output 2N2222A stage is driven over such extremely wide limits. On one peak the collector current is reduced to virtually zero, while on the other peak the collector current reaches the maximum possible with the supply voltage and the load resistor (R5) used.

Construction hints

The exterior and interior of this model are sufficient to indicate the general layout and parts placement. This layout need not be followed exactly, although standard good wiring practice should be used.

Although the model was assembled in a standard 3 x 4 x 5 inch metal box, either a larger or smaller case may be used. If a smaller case is employed, the wiring will require somewhat greater care. Even a plastic case can be used.

All controls and switches in the model were labeled using commercially available black decals protected after application by three coats of clear plastic. The plastic coating is easily applied with a standard spray can.

The battery is held in place by a small "Z" bracket, with its connections made simply by soldering leads to its

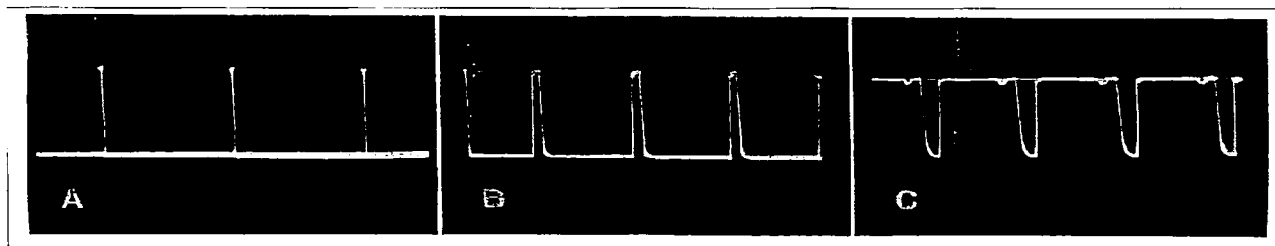
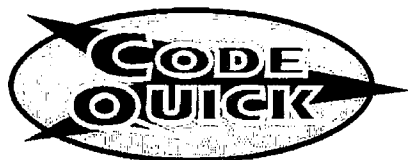


Fig. 2. Waveform of output pulses obtained from the author's model. (A) Low-frequency (200 pps) positive-going pulse. (B) High-frequency (6000 pps) positive-going pulse, and (C) high-frequency, negative-going pulse (6000 pps).

Part	Description
R1	2 meg carbon potentiometer ("pulse rate control")
R2	27k 1/2 W
R3	6.8k 1/2 W, see text
R4	18k 1/2 W
R5	10k carbon potentiometer ("output control")
C1	0.1 μ F disc
C2	0.05 μ F disc
C3	0.5 μ F disc
C4	100 μ F 25 WVDC electrolytic
S1	SPDT toggle switch ("polarity control")
S2	SPST toggle switch ("power control")
B1, B2	Two 9 V batteries in series
T1	Universal audio output transformer (Stancor #A-3856 or equiv., see text)
Q1, Q2	2N2222A

Table 1. Parts list.

tin end terminals; or you may want to use battery clips. A certain amount of care must be exercised when doing this



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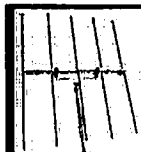
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to avoid overheating and shortening the life of the battery.

Scotch electrical tape was used to insulate the exposed battery terminals after the connecting leads were soldered in place.

Another builder might prefer to devise and construct a small clip or socket for the battery, so that it would not be necessary to use a soldering iron to remove or replace the unit.

I installed the transistors in the model by simply soldering them in place. Should the prospective builder decide to follow a similar course, exercise special care to avoid accidentally overheating and damaging these components.

Transistors are especially sensitive to heat damage. Where they are to be soldered in place, the leads should not be cut too short and the actual soldering should be done as quickly as possible using a well-tinned and quite hot iron. An alternative is to provide sockets for the transistors.

The primary connections of transformer T1 are identified by color-coded leads when the secondary connections are identified by numbered terminals. The proper connections for the STANCOR transformer that I used are indicated in Fig. 1.

Parts substitutions

A number of parts substitutions are permissible in order to change the operating characteristics of the pulse generator. However, in addition to these component changes, a number of other parts may be changed without modifying the basic circuit.

As mentioned earlier, either a larger or a slightly smaller case may be used without difficulty. In some instances, a builder may wish to wire the pulse generator into an existing piece of equipment.

Slide or rotary switches may be substituted for the toggle switches used as the polarity and power switches in my model. If preferred, a volume control-type switch could be used for the "power" switch, permitting this unit to be combined with either the pulse rate or output controls.

Although binding post output

connectors were employed, tip jacks, banana jacks, or even a coaxial or a BNC connector may be used instead.

An Eveready type 411 battery may be used in place of the battery specified in the parts list. This unit is about the same size physically and supplies the same voltage as the battery I used.

Capacitor C4 is not critical, since it is used only for bypass purposes, and a smaller or larger unit may be substituted here without difficulty.

The size of the output blocking capacitor C3 is noncritical, and either a larger or smaller capacity may be used here if desired. The larger capacities are suggested to prevent possible distortion of the output signal waveform.

Circuit modifications

The basic pulse generator may be easily modified to suit the specialized needs or requirements of the individual builder. Let us discuss the more important modifications in order:

Changing pulsewidth. As mentioned earlier, the pulsewidth depends primarily on the characteristics of the transformer used in the blocking oscillator circuit. I used a standard "universal" audio output transformer. Where the prospective builder has access to special transformers, it should be practical to substitute another unit to obtain either a narrower or a wider pulse.

Changing the pulse rate range. My model covers a range from approximately 100 to 6000 pps. Where a different range is desired, it is necessary only to change the value of C1.

Using a larger capacity here will reduce the operating frequency, while a smaller capacity will increase the frequency. If desired, several ranges might easily be provided by using a selector switch to choose different values of C1.

The pulse rate range covered by the pulse rate control may be extended to provide wider coverage or reduced to provide more accurate adjustment. To extend the range covered by the control, use a potentiometer having a larger maximum resistance — a 5 megohm or 10 megohm pot, for example. To reduce the range covered by the control, use a pot of lower maximum

resistance (1 megohm, 500,000, or even a 100,000 ohm unit). Where pulses at only a few fixed repetition rates are desired, a selector switch may be substituted for the "pulse rate" potentiometer, and fixed resistance values chosen as the switch is rotated.

Changing the output impedance. Where a lower or slightly higher output impedance is desired, it is only necessary to substitute a potentiometer of the desired impedance (resistance) for R5. When this is done, care should be taken that the output transistor cannot be accidentally overloaded. Do not use a pot of less than 3000 ohms with an 18 volt supply.

Obtaining pulse of fixed amplitude. Where the user will not need an adjustable output amplitude, a fixed resistor may well be substituted for R5. The output pulse amplitude should approximate the battery supply voltage and should remain fairly constant, even at different repetition rates. A fixed amplitude signal with a lower value may be obtained by using two fixed resistors in series in place of R5 to form a simple voltage divider. The output signal is obtained at the junction of the two resistors.

Obtaining pulses of fixed polarity. Should the user not require both positive- and negative-going pulses, the pulse polarity switch may well be omitted and the circuit permanently wired to deliver whichever type of signal the user requires.

Conclusion

The possible applications of a pulse generator are too numerous to more than briefly indicate. New applications are constantly being worked out, and the individual worker often finds that the only limitation on his use of the instrument is his or her ingenuity and skill in applying it.

The pulse generator is particularly valuable for operating many types of "slave" sweep circuits or for synching recurrent sweeps and multivibrators. A simple linear sweep (sawtooth signal) generator may be formed by using the positive-going pulse from a pulse generator to operate a discharge transistor connected across the capacitor in a

simple RC series network. The capacitor is charged slowly through the resistor from a DC source, and then discharged rapidly by the transistor when a positive pulse is applied to its base.

Pulse generators are widely used for checking and testing delay lines, for checking the transient response of amplifiers, for testing counter circuits, and for calibrating and testing radiation instruments.

The pulse signals obtained from a pulse generator are also useful for oscilloscope retrace blanking and for use as a marker to divide a scope trace into segments of known duration. In both of these applications the pulse signal is applied to the "Z-axis" or intensity modulation terminal of the scope.

Considering the small amount of time and money required to build this compact unit, it makes a worthwhile project.

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Be a Caribbean HEARO

How about a little mini-DX from the USVI?

Tired of getting your winter Vitamin C from some little pill? I have found my trips through the Caribbean to be a much more FUN way to do it, allowing for a bit of common sense like wearing the proper clothing and — of course — sunscreen.

For the fall trip, since I mow about 4 acres all summer, that is as simple as a hat to cover the thinning fur on top, and about SPF 15 or so sunscreen. For the usual trip around April, so I can include the fun of Carnival, I have actually considered something on the order of SAE90 Valvoline for sunscreen. If this article warns of nothing else — the sun it HOT down there — so don't even compare it to trips made to Florida or Texas!

The latest trip was 11/21 to 12/3 of 2002, so I am not long back, and minus 71 degrees of heat from there to here. The "there" this time refers to St. Thomas, USVI.

Forgive me if I bore some of you with basic details, but I am always amazed at how many people here on the mainland USA have either never heard of it, or worse, place it somewhere in the sunny Pacific. It gets only slightly better when I tell them it is about 70 miles east, airport to airport, from San Juan, Puerto Rico.

The questions then lead to things like, "Who owns it?" (We, the USA, "own" it — sort of — it is a U.S. territory just like Guam — which *is* in the Pacific.) Or, "What language do they speak?" (English, just like us — if you can call our Americanese English. I know several Brits who would disagree — hi!) And of course there is always the thing all travel boils down to: "What is their currency?" (Good ol' Yankee dollar — 1 for 1.)

And that holds true for all three of the major USVI:



Photo A. Northeast view from the ham shack. St. John, USVI, to the right, about 6 miles away; Tortola, BVI, straight ahead, about 13 miles out.



Photo B. Charlotte Amalie harbor in St. Thomas, with cruise ships at the Havensight Mall docks.



Photo C. Sunset from a nice dinner place right below where the usual ham shack in the past has been high on the eastmost mountain.



Photo D. The super-portable ham "shack" used on the November 2002 trip.

• St. Thomas — where I generally go because of business and the many friends made there since the first 1984 visit.

• St. Croix — larger in size, but much more the industrial base versus St. Thomas's tourism.

• And last, the much smaller, quieter, St. John — where over half of the island is National Park, offering excellent camping options. I know there is no electric (or "gennys" allowed — noise!) on the "bare" sites where you bring your own "everything." I would think that you could operate (quietly — think of your neighbors and why THEY are there) from any of the other sites that do have electric. Best you check first, same as anywhere, but it is the same National Park Service as up here, so it should be quite easy to find on the Internet.

Before moving on, there are also three beautiful islands right to the east of St. John that are the British Virgin Islands (or, as more commonly called, "the BVI"), which ALSO take US dollars. And they don't just accept them — the dollar IS their currency. And they're not hard at all to visit — all you need is simply a valid ID like driver's license with picture, notarized/certified copy of birth certificate, or — get this — even a voter registration card!

It was the planning of this fall trip to include for the first time, the BVI, and a previous two-week visit earlier this year in April to Trinidad, that

prompted me to ask Wayne about writing up an article about the "mini-DX" trips he often has been on and related himself. There were some things that the ARRL site were just not keeping up on. That is not their fault entirely, as it would certainly take a full-time employee polling just the Caribbean islands once a week to be always "current," and that is just not practical.

I offer that information more so that you will not be shy about using things like the Internet, or consulates here in the USA of "foreign" places you think would be fun to visit, and even more fun to operate from. I can tell you for a fact that since the first ham operations were done by us there in St. Thomas, about 1994, it has been so much fun to be at the BOTTOM, and the source or reason for a 100-kHz-wide (and more) pileup — instead of sitting frustrated on the other end trying to work the DX.

This will also quickly teach you how ridiculous and inconsiderate stations trying to work the DX can be. Sadly, it is stateside stations with ?kW who are the worst offenders. I mean really, guys, St. Thomas is fun, and mini-DX to be sure, but it is NOT some ROCK in the South China Sea with about a one-in-a-1,000 chance of becoming the latest DXCC country number. (Have they fudged enough places as "countries" to reach 400 yet? And more so — who cares?)

I would offer my limited twice-a-

year-or-more opinions on what works best for us under those conditions, right along with apologies to those patient souls who hold back and TRY to remain sane while working us. As the saying goes, "When the going gets tough," And we TELL everyone right on the air.

When it becomes less than gentlemanly, less than fun (a HOBBY), and people (fortunately few) get snotty, there is the beach — the local rum — the local food — the not-so-local "eye candy" from the cruise ships mostly (and if Wayne follows what that is, then so will most hams, as we ALL are not getting any younger — hi). So we simply pull the plug! Sometimes it is just for an hour, and we go for a quick swim nearby (the whole island is only 13 by 4 miles), and we are on a mountaintop right at the east end and less than a mile to FIVE of the prettiest beaches — duh. Other times, it becomes, "Let's go shop, or scuba, or snorkel, or" You get the idea.

I considered, if only briefly, giving you a chapter and verse on all the ins, outs, and equipment that I/we carry, but it can actually be fun PLANNING and getting ready for the trip on your own. For that reason, I would highly recommend that your first visit to the Caribbean be to St. Thomas. The obvious no-brainers like citizenship, currency, language, and such definitely apply. Also, because you are not aware of it, I will tell you that they have at

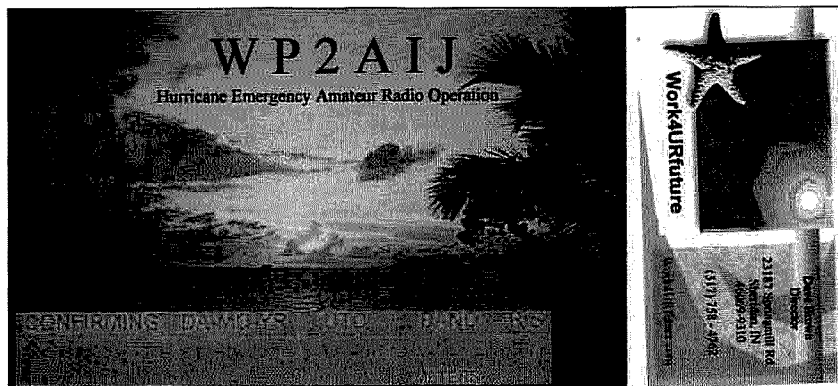


Photo E. HEARO/WP2AIJ QSL with detachable business card.

least two Radio Shack stores (you are not out camping in the bush!), and grocery stores where you will recognize at least 70% of the foods offered (and I recommend that you TRY the rest). I can guarantee that you will be well taken care of if you book through us (for a place to stay — for travel you are on your own, except that we would offer suggestions of whatever we know on that).

On the ham radio part: One of the places we stay at and is rented to other hams year-round has a permanent antenna setup — 30-ft. pole with Cushcraft R5 atop — that has a FULL 360-degree view out over salt water. You have not operated until you see what salt water ground anywhere near you can do for you.

On the other hand, actual station grounding was not simple as you are on a volcanic rock. St. Thomas harbor at downtown Charlotte Amalie (largest town) IS the crater of a dormant

volcano. There is still a rather hefty (35A, I think) boat anchor ASTRON supply there in the ham shack (yep, they built us a room no less), but I firmly believe in you taking your own radio and power supply, and that the power supply be a line-protected switcher.

To give you a starting point, I have run a DX70T Alinco and the ASTRON SS-20 and covered many a mile of the Caribbean island-to-island in a converted and foam-lined camcorder case (which DOES meet all carry-on requirements regarding weight and size). I still have room in there for the actual PTT mic (not often used, but nice backup), logbooks, etc., and even a small digital recorder to save my voice on solo trips.

The ham shack room came about when friends from the Thomson Amateur Radio Club went down with me in 1994 and we operated from a terrific beach house on Cabrita Point (far east

end — but NO elevation!). It was nice and close to the beach, however (see handling pileups — above), and the beach/trees/salt water made for good support for the wire coaxial dipoles we carried that trip.

A lot of talking and planning after the return from that first adventure led to us forming a club for down there, with the expressed reasoning of emergency communications location — but supported by year-round use by amateurs like us. Thus, the HEARO club was born (H>urricane E>mergency A>mateur R>adio O>peration) and WP2AIJ (Whiskey Papa 2 America's Island Jewel) took to the amateur airwaves. It has been a FUN time by all ever since.

My trip this time was solo — I no longer “work-fo’-de-man” and set my own hours (and days — hi), and I was trying out yet another site only a bit down the mountain on the northeast side. The HEARO ops down there are ALWAYS done QRP — 10 watts or less any mode — but not because we are all, or even any of us, diehard into QRP.

Think about emergencies for a minute, like hurricanes. Add to that the isolation of an island. One GOOD thing about that is the large number of easy-to-obtain deep-cycle marine batteries! Running 10W, we figure we are good for DAYS on just one battery — maybe weeks, with a bit of caution and time watching. So our fun is also the POP (proof of performance) to hand to FEMA, Red Cross, CD, or anyone who wants our help or location.

To put the naysayers to rest — we have QSL CONFIRMATIONS from ALL the “real” countries! We are not down there to just DX — or contest (though that is allowed, of course) — or to talk to some rock passing for #400. The greatest fun so far has been to populate the 12m and 17m WARC bands from down there at least twice a year.

There was a time when two things kept KP2 land from being heard on WARC: A lot of hams (like the rest of us up here lately) were older, retired, moved business there for warmth just like FL and so on, and many had rigs

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Photo F. Back of HEARO QSL.

that just plain did not have the WARC bands. The few that did got buried every time they came on the WARC bands, with all clamoring for QSLs — and that can be costly these days. We simply filled that void and had a ball doing it.

On the subject of QSL cards — and the few loyal souls who still really DO it and not just pass out the hot air of, “Yep, QSL 100%” — may I offer our observations there as well? Let your conscience be your guide. We (HEARO/WP2AIJ/the club) DO QSL 100%, and sadly, with postage going up and up, this has become quite a realistic burden. We kept cutting costs over the years by going to laser-printed cards done from one “master” file, but in many club members’ homes. We took the postage burden on ourselves — which is NO fun when you pass the 1,000 mark and figure you just paid for someone’s airfare! Our answer to this so far has been that we will NOT ask for “green stamps.”

Somehow, that grates on all of us the wrong way and leads to PAID expeditions whose receivers only seem to “hear” the color green. If the ARRL ever gets their electronic eQSL program actually going instead of talking about it (bureaucracy moves slowly), or would just simply “adopt” the whole perfectly-working-and-secure-that-I-can-see [www.eqsl.net] operations, then the whole problem would be solved.

As it is, I am trustee for the station and also official QSL manager (with lots of help from the guys), and so I set the digital recorder program half that gives QSL info to read “as follows” — and it works. Come into this century with us and quit worrying about bureaucrats at ARRL accepting eQSL — and you get an IMMEDIATE eQSL on my return (I was back 12/3, and on 12/4 they ALL went out).

Next, for all stateside stations that “should” understand the cost problem of postage, we merely ask that you send YOUR real QSL and preferably a business-size SASE, because we do a standard-size QSL with a “tail” that is also a business card you can slice off. For the foreign stations, we leave it to

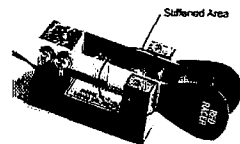
them. By bureau is fine — we can usually have all those done and bundled and sent inside 30 days (so you may only wait a year to get it). OR, you can QSL direct like stateside, with your card and “postage.”

As that was 34 cents that last round and now 37 cents and climbing, — we finally gave in to THEIR request to just send one even green stamp US, and apply any difference to our HEARO ops — VERY nice of them! I think you will find that group the easiest to deal with on ALL subjects while down-islanding. Hi hi.

I want to keep this effort rather short, to the point, and yet general in nature, so if you are even thinking of a down-island battery recharge time for your body and soul — feel free to contact me through the Web site (sorry — I’ll start giving out my “real” E-mail address when all the SPAM is back in the can — WITH the spammers) [http://www.work4urfuture.biz].

I have learned a lot about moving up a notch and visiting other islands where you can NOT just use your license as on the USVI. One is the Trinidad trip I just finished in the spring, and the realities of how to make that a real ham radio adventure (versus what I gleaned from the ARRL travel site and those listing information on it, which were two totally different things). It is just too easy, with my help I guess, to get direct answers from all the right people right ON the island you intend to visit — it is called the Internet! 73 and happy mini-DXing — it is a BALL.

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73 Repaired My TV

Thanks, guys!

Being a ham, I read 73 Magazine and was very interested in the articles on digital TV/VCR tuners written by Hugh Wells¹ in the issues from September 2000 through March 2001. From those articles, I learned enough about digital tuners to give me the confidence to work with them.

These TV tuners looked useful for ham test gear, including monitoring local ham repeaters, and were selling for \$5 to \$10 at local swapmeets. The hardware to exercise the tuners, described in 73 articles, looked easy to construct. Before starting my project of building a ham test generator, there arose an emergency need to repair my TV set, which appeared to have a bad digital tuner. This offered me an opportunity to work and

gain experience with digital tuners and further prepared me to work on my ham test generator project. Here is my story ...

TV failure — Troubleshooting symptoms

My own 15-inch Sharp color TV suddenly developed problems. See **Photo A**. All UHF channels and only VHF channels 7 and 13 looked OK.

Channels 2, 4, 5, 9, and 11 *always* failed after running for 5 to 10 minutes. After they failed, I observed no picture — only snow with no sound.

Like any ham troubleshooting a ham receiver gone bad, I studied my TV's failure symptoms, which were as follows:

1. Color, sound, and sync were perfect on some VHF and *all* UHF channels.
2. At the same time, while some VHF channels were OK, other VHF channels were pure snow without sound.

Displaying a good sync'd picture and sound could only happen because video/sound IF, HV, sync/separator, yoke, and flyback circuits were working OK. Since the tuner obeyed the TV's remote control by actually displaying the correct channel, I concluded that the tuner's digital chips were obeying digital commands from the TV microprocessor. Failures in those TV and tuner circuits were ruled out. Snow instead of picture with no sound only on some channels suggested that on failing channels, the tuner was off frequency or lost all received signal. I suspected failure of the tuner's RF/mixer/oscillator circuits.

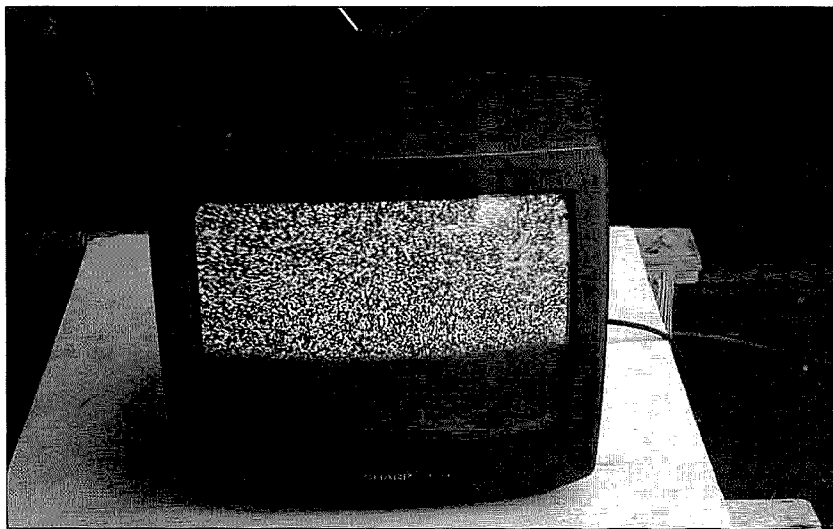


Photo A. My failing Sharp TV.

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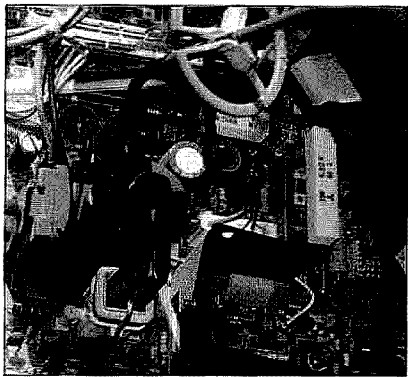


Photo B. The bad tuner on the TV motherboard.

After studying the digital tuner articles in 73, and the TV symptoms, I believed I could purchase suitable digital tuners at a swapmeet. Part of the adventure of this repair was to replace my bad tuner with a tuner that was *not* an exact replacement tuner. Instead, the goal was to use whatever similar tuner I could find at the swapmeet but not necessarily one that was meant for this specific model Sharp TV. Information from the 73 digital tuner articles suggested that *exact* replacement tuners were not

needed. Only digital tuners using the same digital chip set were required for compatibility. The digital chip in the tuner that must understand commands from the TV microprocessor was the phase locked loop [PLL] and synthesizer [SYN] chip, not the mixer/osc or channel 3 and 4 modulator chips.

Actually repairing the TV

I removed the rear cover to locate the digital tuner, and found that the tuner was mounted on the motherboard [MB]. See **Photo B**. I found that parts on the MB adjacent to the tuner were almost touching the tuner's metal sides. Fitting the replacement tuner onto the MB would be a tight fit.

Since troubleshooting convinced me that the tuner was really bad, I questioned how to approach this repair. A local tuner rebuilder quoted \$65 for an *exactly* rebuilt replacement. For my budget, \$65 was too much money, especially since there was a remote chance that the tuner was not really causing the failures. I assumed that any swapmeet tuner, if not usable in my TV, was still usable for my ham projects.

If I removed the tuner, could I actually repair it myself? Without tuner documentation, the only repair possible by me was to resolder parts inside the tuner. An Internet newsgroup² indicated that some varactor digital TV tuners did actually have troubles traceable to poor solder and were repairable

by CAREFULLY resoldering. But, resoldering tuners with SURFACE MOUNT DEVICES [SMD] is delicate work and carries risk of creating damage rather than repairing faults. A high skill level and some special equipment is required to ensure a repair without damage.

Opening tuner

To remove both metal covers, it was necessary to unsolder the tuner from the MB pads and dismount the tuner from the MB, which I did. See **Photo C**. I removed all metal covers so that I could see both sides of the printed circuit boards with chips and components. All ICs, diodes, Rs, and Cs were in SMD packages.

It became apparent that resoldering by me was too risky and beyond my skills. A far less risky approach was to replace the tuner, which I decided to do. In my failing tuner, I found two SMD chips: MC44817D was the PLL/ SYN chip, and Sharp XT648N was the mixer/OSC.

Replacing the tuner

Now that resoldering to repair was not advisable, and a rebuilt tuner was too costly, it was time for me to find another compatible replacement tuner.

From Mr. Wells' 73 articles, I had a good idea of the signal and

Continued on page 24

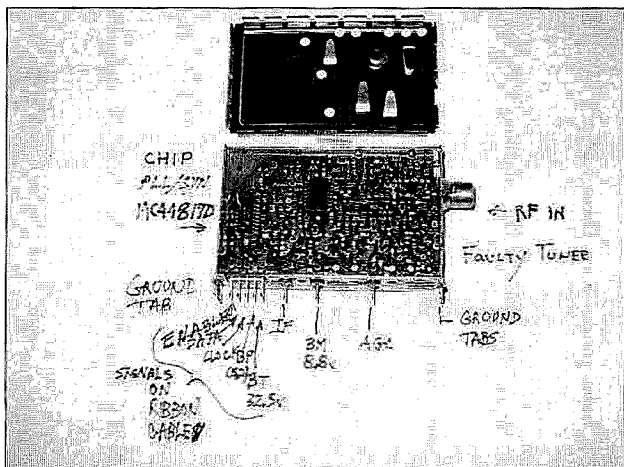


Photo C. All parts in the bad tuner are surface mount devices (SMD). I've marked this photo to show signals/voltages on three large pins and 5-pin header.

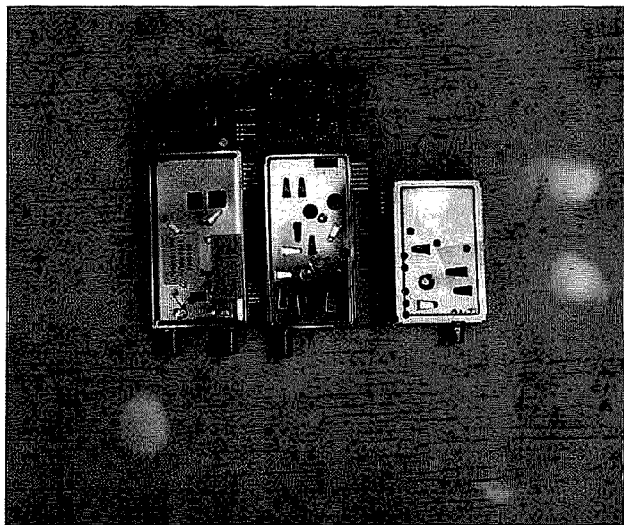


Photo D. A few shapes and sizes of swap meet digital tuners.

73 Repaired My TV

continued from page 23

power requirements for ANY digital tuner that would be compatible with my existing tuner.

A compatible tuner

What are the requirements for a compatible tuner? First, the replacement tuner must use the same SYN/PLL IC as my present bad tuner. My bad tuner used a MC44817D. Next, the replacement tuner must use the same analog and digital signals and voltages as my tuner.

I looked at the component and signal names marked on the bottom of the MB, at the tuner location, and found my tuner had 10 pins carrying signals, power, and ground which connected to pads on the MB. A replacement tuner, if it must drop into the existing MB tuner area and pads, would need to have four mounting feet, three large diameter pins, and five signal pins on a small header, **Photo C**.

On **Photo C**, see:

1. AGC, RF input (RCA) and IF output signals.
2. BM, BP, and varactor BT voltages.
3. Four low inductance ground pins.
4. Digital signals: Clock Enable and Data.

However, I still needed to know exact BM, BP, BT voltages for my MB/tuner.

The easiest way to settle power supply voltage questions was to measure those

voltages when the TV was operating, which I did measure. I found that BP = 5.2 volts, BM = 8.8 volts, and BT = 32.5 volts.

I now had a good idea of what signals and power supply voltages would be needed by a replacement tuner.

Finding a replacement

I went to the local ham swapmeet, bringing my failing tuner to help match it to another one. At the swapmeet, I found that digital tuners were being sold. See **Photo D**. Some tuners were attached to their MB and other tuners were disconnected and in bags. Some tuners in bags had signal and power supply info, some had no info. Had to look through piles of MBs and bagged tuners, and I had to remove metal covers to determine if an MC77814D IC was used.

As I looked through many swapmeet tuners on MBs, I found several tuners that were very close to the REQUIRED size, signals, and voltages. This was very encouraging, because I could see that their ground, AGC, IF, and BM pins could mount in my MB pad pattern. Looking more carefully showed that while package sizes were very close, the 5-pin header pattern was different from tuner to tuner, and none were found that fit my MB pad pattern. The header contained three digital signals and two voltages.

I did not find any tuner that exactly matched all the body pins and header. Tuners I bought had offset header pins

but otherwise looked like they would mount in the MB.

I bought three tuners at \$5 each for my TV repair and some for the upcoming ham projects. All tuners I bought used proper PLL, ensuring that they could be used in my TV. Having no experience with swapmeet tuners, I bought three to be sure I would get one good one.

A preliminary tuner test

Using one of my swapmeet tuners, I did a preliminary test. I wired one tuner into the MB with a 6-inch-long cable. This cable length created a much longer path for digital signals than when the tuner is soldered directly into the MB. For this test, I did create a low inductance ground connection from tuner to MB consisting of a 6-inch-long 3/8-inch-wide tinned copper braid. See **Photo E**.

First power test

After applying power to the TV and new swapmeet tuner, a good picture and clear sound resulted. As a test, I selected VHF channel 2, a channel that had previously failed, and then tuned to UHF channel 28. Selected channels were perfect. The replacement tuner responded correctly to the remote control commands, and the TV was working correctly. All channels that had previously failed in 10 minutes stayed running for hours with no sign of old faults. I concluded that the original tuner *was really bad*.

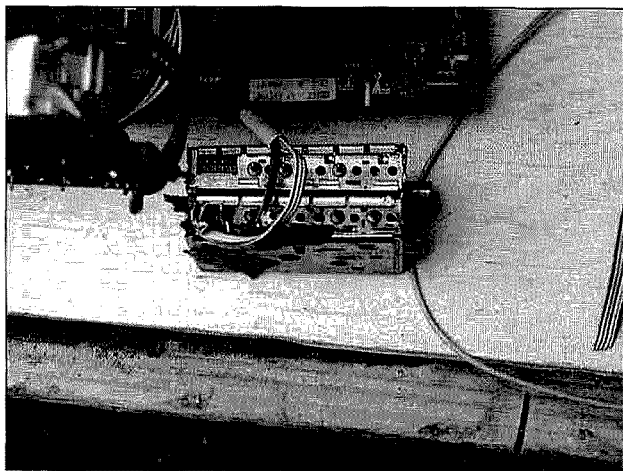


Photo E. First power-on tuner test with test cable attached.

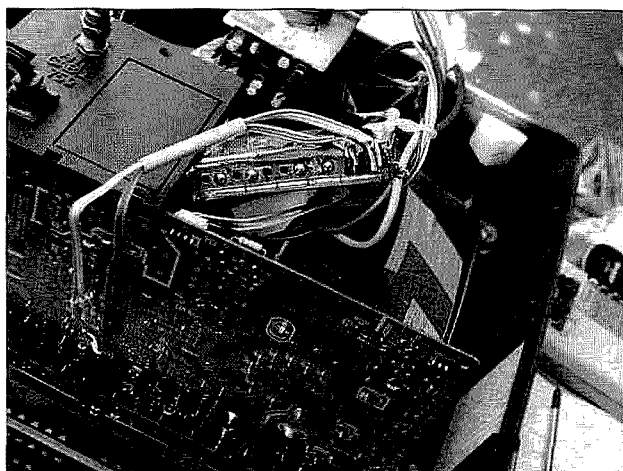


Photo F. Final ribbon cable routing along bottom of motherboard.

This proves the concept that a digital tuner not intended for a Sharp TV could be a usable replacement, performing all original functions, IF THE CORRECT PLL/SYN CHIP SET WAS MATCHED and other signal/power supply needs were met.

This test result was very encouraging, and now it was time to permanently install the swapmeet tuner.

Mounting the tuner in the motherboard

I now attempted to mount the replacement tuner (same size as faulty tuner), onto the MB. The metal ground tabs were too wide and required filing to narrow. Narrowed tabs did allow the tuner to be inserted into the MB pads.

Tuner ground pins in the MB pads created an excellent low inductance ground. After filing tabs, the three large pins carrying AGC, BM, and IF signals also inserted into the MB pads. However, the five signals on the small header would not insert into the MB pads due to different pad layout.

I soldered a 2-inch-long 5-wire ribbon cable directly to the tuner's small header pins and inserted wires into the top side MB pads. The tuner sat on top of the folded ribbon cable on top of the MB. This cable, when folded over, raised the tuner so high off the MB that the AGC, BM, and IF tuner pins would insert into the MB but not pass through the bottom pads, making it impossible to solder the tuner pins. This was not a workable arrangement. A new cable scheme was needed.

New cable scheme — see Photo F

I created a 6-inch ribbon cable attached to the tuner's 5-pin header, routing this longer cable from tuner header along top side of the MB to the rear edge 3 inches away. Then I routed remaining cable back another 3 inches on the MB bottom side back to the tuner's header pads. Since two grounds and three large pins mounted directly into the motherboard, the ground system was ideal. However,

the tuner was not designed to have a 6-inch cable between digital signal sources and the tuner signal inputs. Would the tuner operate with a 6-inch cable to the MB?

When power was applied again, the TV functioned correctly. All functions commanded by remote control unit worked as expected. The tuner swap was a success, and the tuner seemed to operate OK, and sensitivity was identical to that of the previous tuner. I have no idea what brand TV this tuner was designed for, but it is operating just fine in my Sharp TV.

What did I learn from this project?

I learned the following:

1. In a TV that has a faulty digital tuner, it IS possible to use a low-cost replacement digital tuner that is NOT an exact replacement, if the replacement uses the same signals, voltages, and chip set.

2. Finding an exact size match and pad pattern is unlikely, but not a show stopper.

3. If the tuner must be placed at a location other than the original location on the MB, then a cable will be needed for bringing analog, voltage, and digital signals back to the MB. A good low-Z ground is needed between tuner and motherboard. Keep these cables short.

4. Choosing the location for a replacement tuner inside a crowded TV may not be easy. Choose a location to avoid bringing cable near strong fields. I would avoid mounting the tuner near the flyback or deflection yoke parts.

With the successful tuner replacement, I am very much ready to use a swapmeet tuner in my ham signal generator project. I hope you are just as successful working with digital TV tuners as I was.

References

1. *73 Magazine* articles, Sept. 2000–March 2001, "Digital TV Tuners," by Hugh Wells.

2. Internet newsgroup: [science, electronics, repair].



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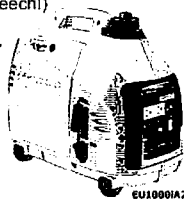
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The Ins and Outs of Parts Substitution

Part 2: Specific devices.

With the diminishing availability of common semiconductors, hams are faced with substituting parts in order to implement circuits from the past. Many of the older circuit designs were excellent and provided a strong technical base for use in ham projects of today.

To implement older circuits, we as hams must be ingenious in our ability to locate and install available replacement semiconductors. Part 1 of this series discussed the steps involved in the substitution process; from searching for the “specific” part to examining the circuit parameters to enable the selection of a suitable replacement part. Specific transistor characteristics were obtained from available sources to create a table of device information in order to demonstrate how device parameters are compared for similarity. Knowing and matching the characteristics of both the old and new device greatly improves the likelihood of a successful device substitution.

Part 2 continues with those tools in mind and applies the process for substituting or replacing an FET. Because FETs are used in RF circuits as well as at low frequencies, the selection process involves a few more steps than those required for a junction transistor. In addition, ICs, op amps, and special devices will be discussed.

FETs

When it comes to substituting one FET for another, we really have our

work cut out for us. FETs are designed in six different configurations, with most operating in a depletion mode and with some operating in the enhancement mode — making up a total of ten FET device configurations. A basic FET device configuration can be one of the following: JFET, single-gate MOSFET, or a dual-gate MOSFET. JFETs are depletion devices and function in a manner similar to a vacuum tube, except that the gate impedance isn’t quite as high as the grid of a tube. Device current conduction increases when the gate swings toward the drain and decreases when the gate swings toward the source. Because of the reverse-biased gate of an FET, the input impedance is very high. In general, the output or drain impedance is similar to that of a junction transistor.

Many older circuit designs called for the use of a 2N3819, 2N4416, 2N5245, etc., junction FET. These can be replaced with an NTE 452 because the electrical parameters closely overlay. The replacement device supports both DC and RF functions closely matching the performance characteristics of the replaced device. Keep in mind that these FETs are interchangeable and will substitute for each other.

Some FETs are designed to function as a switch. When “turned on,” the resistance between source and drain is very low, or high when “off.” As a result the switch device is a very poor candidate for use in an amplifier circuit. Likewise, an amplifier-type FET would make a poor substitute for an FET switch. NTE does provide a series of suitable replacement devices for FET switches. Some enhancement FETs are used in a switch function when the R_{ds} (resistance, drain-to-source) value is low enough during a hard turn-on condition. Another parameter of an enhancement device to be considered during the selection of a replacement is the biased gate turn-on voltage. When used in an analog/linear function, the bias voltage is set to place the quiescent drain-to-source voltage at approximately the center of the operating swing between cutoff and saturation. Shifting the bias point to accommodate the application may be required if a direct replacement part is not available.

Perhaps the most common application for an enhancement FET is for use in audio, and coupled with a low R_{ds} parameter it is capable of controlling high-power circuits. The internal chip structure is made very large, allowing

the FET to handle a very large current. With a resulting large internal gate structure to support the FET control feature, the gate exhibits a high capacitance between the gate and source terminals. The capacitance value can be in the 1,000 pF range, creating a reactance value that effectively eliminates the power enhancement FET from being used in an RF environment.

Fig. 1 shows a junction FET used in a basic linear amplifier circuit. Knowing that an FET is used, the gate impedance can be surmised by examining the value of the R1 resistor. R1 effectively establishes the circuit's input impedance as long as the gate junction is reverse-biased. The circuit's output impedance will be approximately half the value of R2. The value of R3 is selected to adjust the gate bias value for linear operation. Substituting one FET for another in the circuit shown requires only the adjustment of R2 to achieve the desired gain and to adjust the value of R3 to set the bias for the desired linear operating point. Substituting a MOSFET for another in an audio/linear-type circuit follows the same logic and can be replaced using the NTE guide.

RF devices

Both RF transistors and RF FETs become the most difficult to substitute because of the numerous circuit parameters that are directly dependent upon a specific device when used in an RF environment. The most difficult devices to substitute are RF power transistors used in transmitter circuits. As a result, to consider substituting one device for another in an RF power circuit, one must be prepared to change the circuit design parameters to accommodate the "new" device. In general, the RF active board circuit traces, called striplines, are adjusted in length to be resonant at a given frequency and become the "impedance transformer" for a specified transistor.

Below 50 MHz, lumped inductors and capacitors are used in both the input and output matching networks. The input and output impedances of the transistor are known during the board's design phase and are accommodated

by the impedance matching networks (lumped or stripline) connected to the transistor. The objective is to create a desired signal current drive level into the transistor's base circuit. As a simple example, if a replacement transistor is mounted into the circuit location designed for a different device, then the input and output impedances may be sufficiently different, preventing the stage to function as designed. As another example, should the substitute transistor exhibit a higher base inductance (L), a correction will be required to shift the reactance toward a resistive (R) condition. The shift can be accomplished by adding more capacitance directly at the transistor base resulting in a reactive shift from L toward R. When a match is achieved, the base drive current will be the highest at the operating frequency. Of course, the collector impedance value will have to be "corrected" in a similar manner to create an output match for maximum power transfer into the next circuit.

Receiver front-end circuits are a little more forgiving for part substitution than are transmitter circuits. One of the very early RF FET choices was the MPF 102 JFET. Being a VHF device, it opened the door for development of sensitive converter and receiver front ends. Some MPF 102 devices are still available from surplus sources. If desired, an MPF 102 may be replaced with an NTE 451 device.

To demonstrate the substitution process for a MOSFET, let's use the circuit shown in **Fig. 2a** as an example. Take note that the single-gate depletion MOSFET (may also be a GaAsFET) is used in a receiver's RF stage. After doing our extensive search for a replacement, we've determined that only a dual-gate GaAsFET is available. The spec parameters of the dual-gate GaAsFET may surpass those of the older single-gate FET, so that the substitution could be for the better. So our only recourse to "save" the receiver is to replace the single-gate FET with the dual-gate GaAsFET, and that means some mechanical and electrical design changes would be required in

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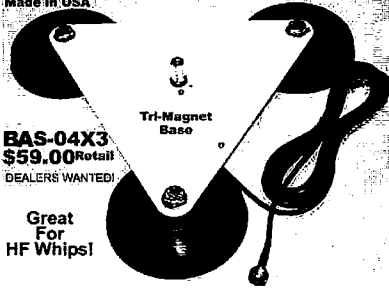
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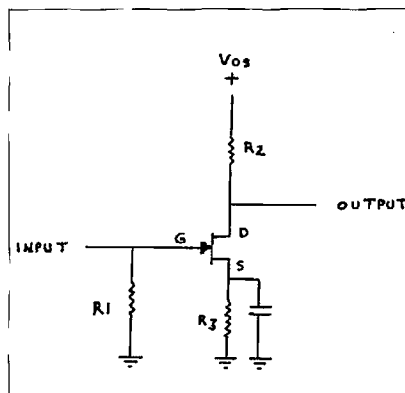


Fig. 1. A simple depletion JFET as used in a low frequency amplifier circuit. The input impedance is approximately equal to the value of resistor R1. The output impedance is approximately equal to one-half of the R2 value.

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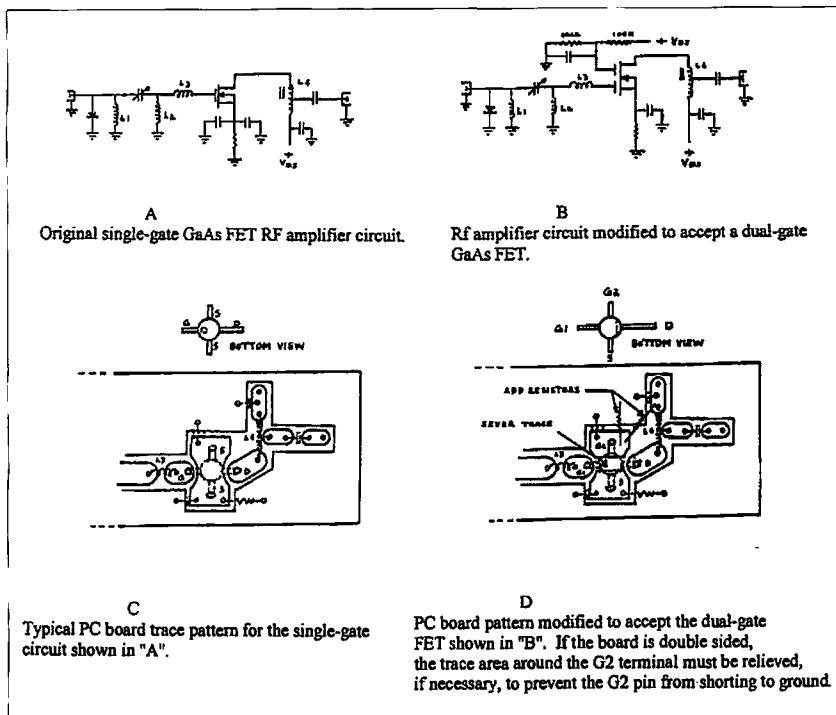


Fig. 2. Steps involved in converting an RF amplifier circuit and PC board from a single-gate GaAsFET to accommodate dual-gate GaAsFET: (a) Original single-gate GaAsFET RF amplifier circuit. (b) RF amplifier circuit modified to accept a dual-gate GaAsFET (c) Typical PC board trace pattern for the single-gate circuit shown in (a). (d) PC board pattern modified to accept the dual-gate FET shown in (b). If the board is double-sided, the trace area around the G2 terminal must be relieved, if necessary, to prevent the G2 pin from shorting to ground.

The Ins and Outs of Parts Substitution

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the receiver for it to accept the GaAsFET installation.

Available GaAsFETs that will perform well in a receiver front end are a 3SK121 and a 3SK174. Both are dual-gate devices with an upper frequency cutoff of 2,000 MHz. Some caution must be taken when using a GaAsFET capable of 2,000 MHz in a low frequency circuit. Because of the wide bandwidth capability, long leads within a low frequency circuit could easily support sufficient feedback for the GaAsFET to oscillate. When the choice is available, it is better to more closely match the frequency response of the substitute device with that of the application. NTE provides two dual-gate MOSFETs suitable for most general circuit applications — they are an NTE 454 (200 MHz), and an NTE 455 (900 MHz).

When it becomes necessary to modify the original circuit to replace a single-gate FET with a dual-gate FET, as shown in **Fig. 2**, the following steps are suggested:

- (1) Draw out a near to-scale picture of the current FET installation and the surrounding resistors, capacitors, and inductors (**Fig. 2c**).
- (2) Draw out the electrical schematic for the existing FET circuit (**Fig. 2a**).
- (3) Draw out the schematic for the GaAsFET circuit so as to "fit" or overlay the single-gate circuit with the dual-gate circuit (**Fig. 2b**).
- (4) Lay the GaAsFET onto the drawing (#1 above) so that it overlays the single-gate FET footprint. Keep track of the top and bottom side of both the FET and the circuit board.
- (5) Make note of the mechanical mounting differences between the two FETs.
- (6) Plan the circuit board mechanical changes required to accommodate the GaAsFET (**Fig. 2d**).

(7) Plan where the additional bias resistors will be placed when the GaAsFET is installed.

In step 5, the major differences to be accommodated are the source pins of the flat-pack single-gate device. Both source pins are internally connected in parallel to balance the I/O reactances, and are connected externally to "ground," or through a bias network to ground. The footprint of the dual-gate FET exhibits only one source lead connected to "ground." The opposite lead from the source is the second gate (G2). To accommodate the device substitution process, one "ground" pad for the single-gate device must be isolated from ground, or the bias network, to accommodate the G2 gate of the dual-gate FET. With the pad isolated, the necessary resistor(s) and capacitor may be attached to the pad to support the second gate.

ICs

Substituting IC's is another story. IC's, better known as "integrated circuits," are complex circuits made up of a great number of semiconductors integrated onto a silicon chip with the whole to perform a designated function. Because of the unique function of each specific circuit, the opportunity of finding "another" IC that will function in a like manner is unlikely. However, the possibilities that exist are some basic functional parallels between the early RTL, DTL, and select few of the later TTL and CMOS IC's. With the technological differences between them, some supporting external circuit design considerations must be made for an application to function. When one considers the advancement in the TTL and CMOS series of IC's, there seems to be little need to implement an old RTL or DTL circuit utilizing the later technology since the later technology has so much more functional capability — including reliability.

There are some possible substitutes between the 74XX and 4XXX series of logic ICs should the "need" arise. If implementing a logic circuit from scratch, it is perhaps a better choice to choose one single family of ICs rather than to mix families, even though both

may function well with a supply voltage of 5 VDC. Because of the logic threshold voltage differences between TTL and CMOS, though slight, the overall logic function might occasionally glitch when operating at clock speed. However, low speed and step functions are generally accommodated properly even though the families are mixed.

Operational amplifiers

Op amps, unlike digital ICs, are a little easier to substitute. Op amps differ in their performance characteristics, but the basic analog amplifier function of each will adapt to a great many applications. An obsolete or hard-to-find op amp indicated in a schematic can usually be replaced by a later part. The external biasing and feedback networks are fairly constant for most op amp circuits, providing for a routine substitution process as long as the mechanical footprint differences are accommodated.

One of the early op amps is the LM741. Though old in design, it is still a suitable building block for a lot of usable circuits. A dual version of the LM741 is the LM1458 with all of the variants that followed, including the 4558 that was called a precision op amp. The early versions of op amps suffered greatly from "noise" that could be heard as a hiss when the device was used in audio systems. Later versions incorporated JFET input circuits both to reduce the internally generated noise and to raise the input impedance. Because of the large manufacturing volume of the more common op amps, parts continue to remain available for ham applications. Should the need arise, NTE provides a variety of op amps that will replace many of the older part numbers.

Special purpose devices

Over the years, a great number of specialty parts have been developed and then abandoned. One that comes to mind is the tunnel diode. When it was first developed, applications flourished because it was so revolutionary, but being a two-lead device, the total number of applications was limited.

The transistor, being more of a universal device, had a wider application capability, and as a result, the tunnel diode fell by the wayside. However, many older circuits still exist that call for a tunnel diode. The Heathkit Tunnel Dipper comes to mind, and because the tunnel diode is a two-lead device, there is no direct substitute for it. Should it be necessary to repair the dipper's function, it's possible that the circuit can be converted to accommodate a transistor.

Another device that is now considered as obsolete is the unijunction transistor. The uni was a very popular device used in oscillators and timing circuits, and for the making of sawtooth generators. Even though the familiar unijunction device is scarce these days, many of the circuits calling for the device can be modified slightly and made functional using a PUT. A PUT is a programmable unijunction transistor that will perform all of the same functions as the original uni, but with the addition of a bias voltage network that's used to establish the "firing" point.


Because of the wide variety of specialty semiconductor devices, it's difficult to provide a general "fix" for the substitution process. At best, I'd suggest that the circuit/application be examined to determine the requirements being imposed on the device. Once those requirements are understood, perhaps a replacement device can be identified along with any circuit changes that might be required to support the replacement device.

Conclusion

Over the years, many circuit designs have been developed to support radio and electronic circuits, with a great many being applicable to ham radio. As the years have passed, the active elements (tubes and semiconductors) used in radio and electronic circuits have evolved, yet very little in the basic circuit design has changed. However, the active element (semiconductor) has been improved, allowing the older circuit designs to perform with renewed vigor.

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we occasionally find one of interest and desire to implement it into a project. But to implement the circuit we have to upgrade the active element to one that's available, and that's where we typically run into a problem.

How do we identify a modern device to replace the old device shown in the schematic of our desired project — particularly when our parts supply is shrinking. The “fun” begins with a journey through a search process leading us through catalogs, reading specification sheets, doing Internet searches, and doing design overlays to identify parallels between old and new parts. In some cases, it becomes necessary to make minor circuit and circuit board design changes to accommodate the newly selected replacement part.

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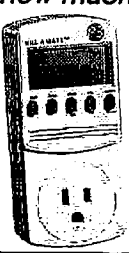
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From my observation, the person who gains the most from the substitution process is the person who learns how to work their way through the process maze. 73!

Reference and search information

(note: This is only a representative/sample listing.)

Books

Cordura Co.
D.A.T.A. Reference Standards
9889 Willow Creek Rd.
PO Box 26875
San Diego, CA 92126
619-578-7600

Catalogs

Allied Electronics, 1-800-433-5700.
Digi-Key, 1-800-344-4539, [www.digikey.com].
Hosfelt Electronics, 1-800-524-6464.
Jameco, 1-800-831-4242, [www.jameco.com].
Mouser Electronics, [www.mouser.com].
Newark Electronics, [www.newark.com].
Radio Shack, [www.radioshack.com]

Internet forums

[http://listserv.lehigh.edu/lists/qrp-l/], group information.
[qrp-l@Lehigh.EDU], post messages to QRP-L.
[gqrp-subscribe@yahoogroups.com], GQRP message group.
[www.gqrp.com], GQRP Internet conference.
[http://groups.yahoo.com/group/Buddipole/].
[http://www.hfpack.com], group/information.
[hfpack@yahoogroups.com], post messages.

Internet parts searches

Appleton Electronics, [www.appletoneg.com].
Chip documents, [www.chipdocs.com].
NTE, [www.ntecinc.com].
PartMiner, [www.freetradezone.com].
Questlink, [www.questlink.com].

Science Electronics, [www.repairfaq.org/REPAIR/F_Obsol_IC.html].

Transistors, [http://members.tripod.com/Malzev/comp/transist.htm].

Manufacturer data

Fairchild, [http://e-www.motorola.com].
Mitsubishi, [www.mitsubishi-chips.com/data/datasheets/hf-optic/vhf_discrete.htm].
Motorola, [http://e-www.motorola.com].
National Semiconductor, [www.national.com/design/index.html].
Texas Instruments, [www.ti.com/sc/docs/eedesign.htm].

Obsolete parts

— [http://www.aeri.com]
Circuit Solutions, [http://www.circsolutions.com/head.htm]
Excess Electronics, [http://www.excesstrade.com/]
IhI Electronics, [http://www.ihielecronics.com]
Obsolete Semiconductors, [http://www.adsemi.com/]
Rochester Electronics, [http://www.rocelec.com/]
Star Electronics, [http://www.4star-electronics.com/]

Parts suppliers

1-Source Electronics, [www.1source-components.com].
All Electronics Corp., PO Box 567, Van Nuys CA 91408; 1-800-826-5432; [allcorp@allcorp.com].
B&D Enterprises, [www.bdent.com].
Circuit Solutions, [www.circsolutions.com].
Dan's Small Parts, [www.danssmall-partsandkits.net].
Electronix On-line, [www.electronix.com/catalog].
Mitsubishi, [www.mitsubishi-chips.com/data/datasheets/hf-optic/vhf_discrete.htm].
NTE, [www.ntecinc.com].
Radio Shack, [www.radioshack.com].
RF Parts, San Marcus CA, [www.rfparts.com].
Sanyo Semiconductors, [www.semic.sanyo.co.jp/index_e.htm].
Westgate, 1-800-213-4563.

Simple Test Circuits

Here are some fun little projects from a veteran Poptronics contributor.

Ham radio is one of the most versatile hobbies we could have, bar none. Think of it, what other hobby offers so many avenues to follow? There are so many ways to transmit and receive information, with numerous modes and modulation types including voice, video, and digital.

However, one very important fact stands out: From the very beginning, the first experimenter built his own transmitter, receiver, antenna, and anything else needed to complete a working radio station. Today, with the complexities involved in almost every rig manufactured, what can a ham do?

Building can still be one of the most enjoyable activities of being a ham radio operator. Of course, most of us are not capable of designing and building a complex transceiver, but most of us can build very useful accessories that can add to the enjoyment of our hobby and save some bucks at the same time.

No matter what we end up building, it usually requires some type of electrical power. The two common choices are batteries and AC-operated supplies. If operated in the field, away from AC power, the choice is batteries; AC is the practical choice for in shack operation.

Direct plug-in power supplies are found in great numbers powering everything from shavers, wireless phones, radios, and many other devices, which may have a useful after life in powering our ham projects.

Usually the power supplies outlast their appliances and end up in closets, drawers, and our treasured junk box. Two of the most useful types of wall-warts are the ones with built-in full-wave rectifiers. **Fig. 1A** shows a full-wave bridge rectifier circuit, and **Fig. 1B** shows a center-tapped transformer full-wave rectifier circuit. Generally, the DC output voltage and current ratings are listed on the transformer; however, the actual output

voltage most often will measure higher than the labeled voltage. The labeled voltage usually refers to the output under load or after being regulated by the appliance.

I have yet to find a wall-wart with an onboard regulator. **Fig. 1C** shows a simple IC regulator that can be connected to the output of most wall supplies. The wall-wart's actual supply

Continued on page 32

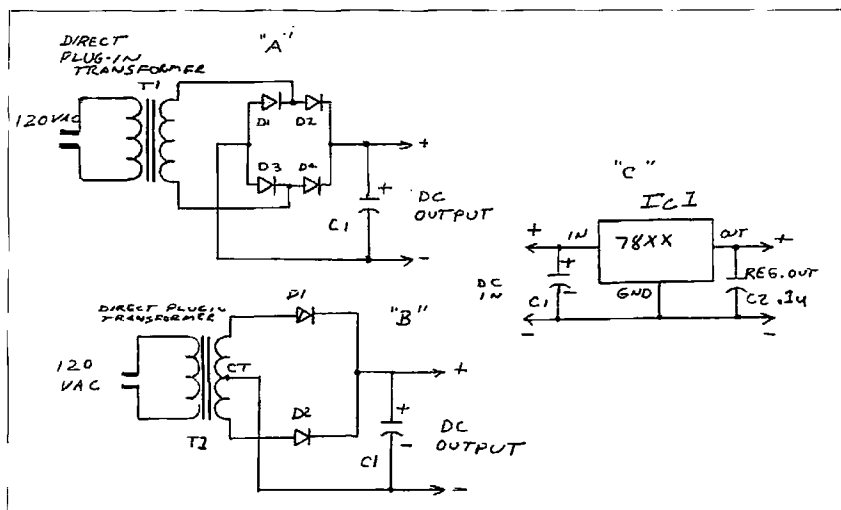
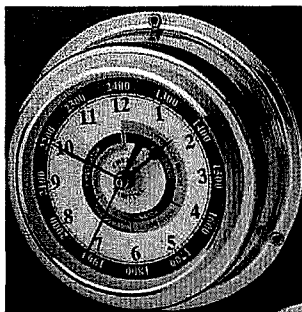


Fig. 1. Basic wall-wart circuits and add-on IC regulator.



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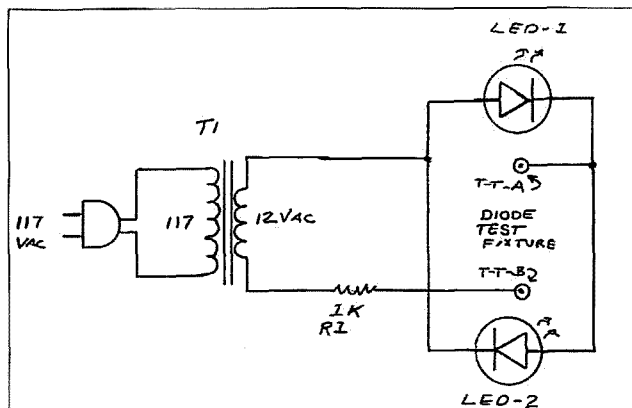
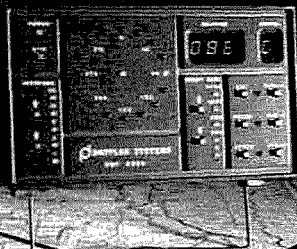


Fig. 2. AC-powered diode tester.

Simple Test Circuits

continued from page 31

voltage must be several volts higher than the regulator's output (minimum of 3 volts differential).

Most wall-warts output a raw DC voltage, relying on the appliance to supply the filter/storage capacitor. A majority of the wall-wart supplies that I've found are rated below 1 amp in output, with most in the 100 to 500 milliamp range. Adding at least 1000 μF to the raw DC output before connecting to the regulator IC is a good starting place. As the output current demand goes up, so does the need for additional capacitance.

Diodes, diodes, and more diodes fill my junk box — and so many without credentials. Since we use so many diodes in our circuits, it's always a problem to sort the good from the bad ones; however, that no longer needs to be the case. Our next three diode testing circuits will do that job just fine.

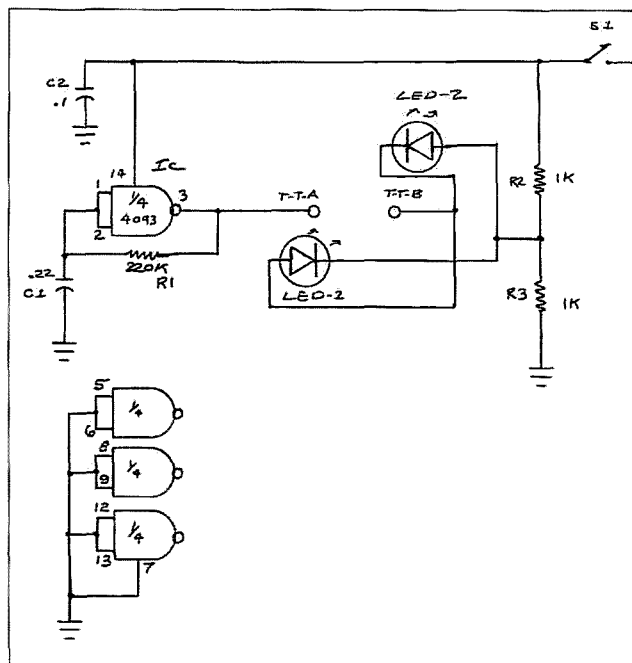


Fig. 3. Battery-powered diode tester.

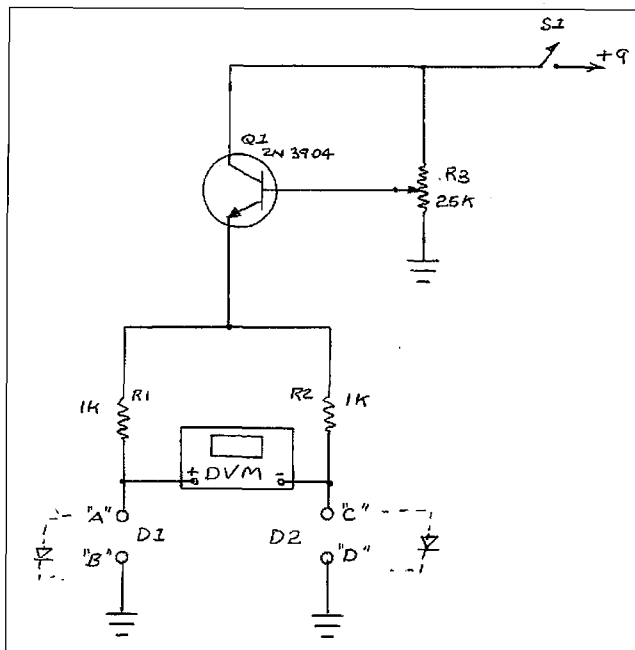


Fig. 4. Matching diode test circuit.

The first diode testing circuit — see Fig. 2 — will help to determine the diode's anode and cathode leads and whether the diode is open or shorted. A low-current 6 to 12 volt transformer, a resistor, and two LEDs are all that are needed for this simple diode testing circuit. Here's a good place to use that wall-wart that does not have built-in diodes and is an AC-only output device. The two LEDs are connected in parallel in opposing polarity and are in series with the diode test terminals.

Connecting an unmarked diode to the test terminals will produce one of the following results. If LED-1 lights, the diode's anode is connected to test

square wave AC voltage for the test circuit.

A good diode with its anode connected to test terminal "A" and its cathode to terminal "B" will light LED-1. LED-2 lights when the cathode of the diode under test is connected to the "A" terminal and the anode to the "B" terminal. This tester will also light both LEDs when a shorted diode is tested.

Often a circuit will require a pair of matched diodes with the same forward resistance and voltage drop. The circuit in Fig. 4, along with a digital voltmeter, will do the trick. Q1, a 2N3904 NPN transistor, is connected in an

emitter-follower circuit supplying a resistance bridge circuit with a variable voltage source. Two matched 1/4 watt, 5% 1k resistors make up one-half of a basic resistor bridge circuit, and the diodes under test make up the other half. When $R1 = R2$ and $D1 = D2$, the voltage at the DVM will be zero, indicating a perfect balance, or match. Any voltage reading indicates a mismatch

Continued on page 53

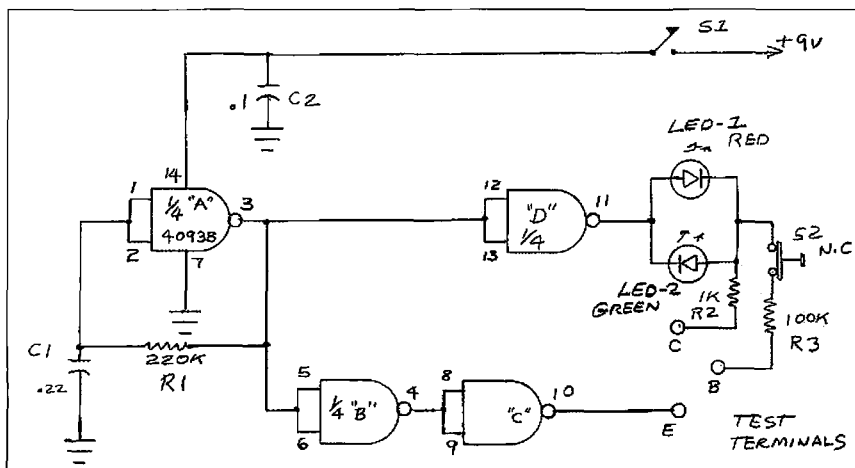


Fig. 5. NPN/PNP transistor checker.

emitter-follower circuit supplying a resistance bridge circuit with a variable voltage source. Two matched 1/4 watt, 5% 1k resistors make up one-half of a basic resistor bridge circuit, and the diodes under test make up the other half.

When $R1 = R2$ and $D1 = D2$, the voltage at the DVM will be zero, indicating a perfect balance, or match. Any voltage reading indicates a mismatch

Parts list for Fig. 1

	Direct plug-in power supplies
	78XX-type voltage regulator suitable for wall-wart used

Parts list for Fig. 2

T1	12 VAC wall-wart transformer with output of at least 50 mA
LED-1, LED-2	LED, any color
	Test terminals

Parts list for Fig. 3

C1	0.1 µF disc ceramic
C2	0.22 µF disc ceramic
IC	4093 quad 2-input NAND Schmitt trigger
R1	220k 1/4 W 5%
R2, R3	1k 1/4 W 5%
S1	SPST power switch
B1	9 V transistor battery or power supply

Parts list for Fig. 4

Q1	2N3904 NPN transistor, or similar
R1, R2	Matched 1k 1/4 W 5%
R3	25k pot
S1	SPST power switch
DVM	Digital voltmeter
	Test fixture

Parts list for Fig. 5

C1	0.22 µF disc ceramic
C2	0.1 µF disc ceramic
LED-1	LED, red
LED-2	LED, green
IC	4093 quad 2-input NAND Schmitt trigger
R1	220k 1/4 W 5%
R2	1k 1/4 W 5%
R3	100k 1/4 W 5%
S1	SPST power switch
S2	Normally closed push-button switch
	Test terminals

Table 1. Parts lists for the various figures.

Test Time for the SG-2020 Transceiver

"If operating were any more fun, it would be illegal!"

In many Asian cultures, turning 60 is cause for celebration. Not so at our home in Smyrna, Georgia. My 60th birthday (August 2002) was met with cries of "You're older than dirt," but on the other hand, it was accompanied by the sort of birthday gift only a ham could enjoy — my very own SG-2020 transceiver.

While there is no shortage of small to tiny transceivers available to the ham market, the SG-2020 is described by the manufacturer, SGC Inc., as a "tactical transceiver," and a quick glance at the unit makes you wonder if it would be as at home in a Bradley Fighting Vehicle or Main Battle Tank as it would be on the ham shack desk.

Scarcely more than a handful, the 2020 packs a large number of features into a very small package (2.75" H x 6" W x 7" L) weighing in at approximately 4.4 pounds. The specific variation I received included the ADSP

(audio digital signal processing option), and the balance of this review will explore the transceiver and its operation, with the latest (April 2003) enhancement of an updated ADSP option that was retrofitted to my transceiver. I'll also be sharing my experiences (see sidebar) with the original ADSP-equipped transceiver.

Briefly, the SG-2020 is a 20 watt (adjustable) SSB/CW transceiver capable of operating on the ham bands from 160 to 10 meters. While you can receive AM broadcasts by using either the upper or lower sidebands, you have to bypass the broadcast filter

for reception of signals in the 400 to 1600 kHz bands, assuming that you would ever want to dedicate a transceiver to a function more aptly served by a less-than-\$10 radio. For those interested in and licensed to operate as a MARS station, "unlocking" the transceiver to permit operation at other than those frequencies assigned to the Amateur Radio Service requires only the removal of three screws and the use of the thumb and forefinger to remove a Berg jumper from the circuit board — a pleasant surprise when compared to the multistep techniques required by most of today's amateur transceivers. In fact, the modification nearly takes longer to read than it does to perform.

What your ham dollar gets you

For less than \$800, you get a low-power, fully functional transceiver capable of operating on the ham bands in CW/SSB modes and fully capable of operation in the digital modes. It's not strictly a QRP transceiver, but rather, I would characterize it (based on my experiences) as a low-power, full-featured transceiver that can be used as a QRP rig, or for that matter a

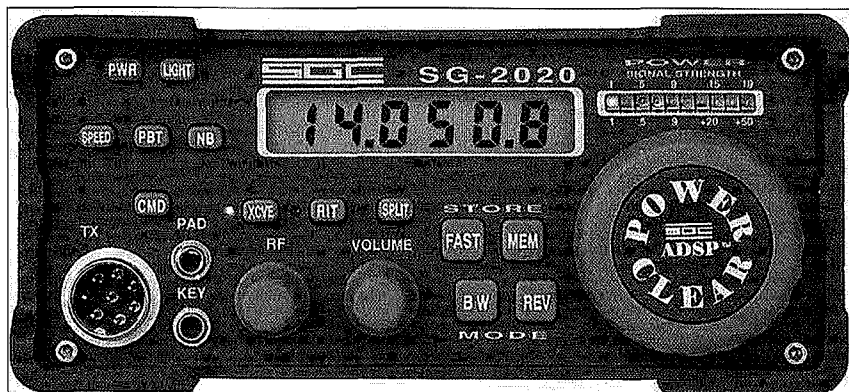


Photo A. SG-2020 transceiver.

Pin	Function
1	Mic audio
2	PTT
3	OPT1 (not used)
4	OPT2 (not used)
5	N/C
6	Phone (Rx audio)
7	Mic ground
8	Ground

Table 1. Microphone pinouts (viewed from front of radio).

low-power, high-performance transceiver as at home in the shack as it is mobile in the car. In fact, its small size and reasonable power requirements (12-18 VDC at 5 A maximum) make it ideal for portable operation as well as fixed station/mobile use. We made up a fused cigarette lighter adapter and have made many QSOs from our car(s) using anywhere from 5 watts to full power and have yet to run the battery down to the point (and we have been known to be long-winded) where the car would not start.

By comparison to most of the amateur transceivers, the front panel is Spartan. The controls are easy to reach and intuitive in operation and the large tuning knob makes frequency changing relatively easy. On power-up, the easy-to-read display informs you of the input voltage and the revision number of the transceiver, and then shifts to displaying the current or last-used frequency. The 8-pin microphone connector on the front panel can be used for direct digital interface (PSK31, RTTY, etc.) and is compatible with the pinouts for Kenwood. The pinout designations are shown here in **Table 1** to facilitate fabricating a suitable soundcard interface.

There are five other user-accessible connectors. Two are on the front panel, the remaining three are on the rear panel. These include:

Sleeve	Ground
Ring	Dash
Tip	Dot

Table 2. Stereo jack pinouts.

- **PAD (Paddle)**, a 3.5 mm stereo jack to permit connection of a user-supplied keyer paddle to the internal iambic mode B electronic keyer variable in 1-word-per-minute increments from 5 WPM to 45 WPM and 5-word increments from 45 WPM through 60 WPM. Pressing and holding the **SPEED** button on the front panel and turning the main tuning knob adjusts the speed and displays the speed on the LCD meter. The wiring configuration is shown in **Table 2**.

- **KEY (Key)**, a 3.5 mm mono phone jack provided to interface with a CW hand key. The key will see +5 volts at a few milliamperes. The SG-2020 is set up for full break-in operation and transmits when the key is closed, or when in the CW mode and the microphone PTT is depressed. A sidetone of 650 Hz is present.

- **Antenna (rear panel)**. Although identified in the manual as an SO-239 connector, the antenna connector is made up of a coaxial "dogleg" providing an in-line SO-239 whose other end is connected internally to the transceiver through an appropriate strain relief device. The transmitter expects a 50 ohm matched load at the operating frequency.

- **DC Power (rear panel)**. Again incorrectly identified in the manual as a 3-pin in-line screw terminal, the DC power connector consists of a length of 2-conductor (red/black) stranded wire, overcovered in heavy insulation and terminated in two (polarized) quick connect (Sta-con) terminals. The other end of the power cable is connected internally to the transceiver through an appropriate strain relief device. Mating connectors (one male, one female) are supplied with the transceiver for interface to the user-supplied power source. Suggested wire gauge for power connections (mobile installations) is AWG #12 stranded.

- **External Speaker (rear panel)**. The external speaker/earphone connector is a 3.5 mm stereo jack. An external speaker or Walkman-type stereo headphones may be connected via this jack. When this connection is used, the internal speaker is automatically disconnected.

The front panel controls and indicators

For the most part, the front panel controls are intuitive. The prerequisite AF and RF Gain controls are present, the Power on/off and a large easy-to-use tuning knob are just about where you'd expect them to be in a well-designed transceiver. Push-button switches are used for functions such as Power, Light (internal backlight on/off), Speed (for CW keyer), XVCE, RIT, NB, and SPLIT, all the same types of controls we are used to on any transceiver. However, there are a few unique push-button switches that perform specialized functions either alone or in conjunction with other controls. Let's explore their function and use:

- **PBT (Passband Tuning)**. Pressing this button activates the passband tuning, and using the main tuning knob while pressing the PBT will change the passband offset as desired. The adjustment rate is from -1000 Hz to +300 Hz in 100-Hz steps and will be displayed on the LCD. Note: Accurate calibration is not supported in passband tuning.

- **FAST (Fast)**. Pressing the FAST button while using the main tuning knob will set the tuning rate to one of four different values: 0.1 kHz; 0.5 kHz; 1 kHz, or 10 kHz. The normal tuning rate is 0.1 kHz. This feature will enable you to QSY rapidly (more about this later).

- **MEM (Memory)**. In place of the usual bandswitching arrangement, the SG-2020 has 20 user-accessible memories. From the factory, the SG-2020 comes with the memories preset to a few frequencies in each amateur band for user convenience. However, these preset memories can be changed by the user at any time. While not numbered (as such), these memories can permit you to store frequently used frequencies for nets, special applications, etc. **Table 3** shows the factory presets as shipped:

Each memory retains the following parameters: Receive frequency, Transmit frequency, Mode, XCVE/RIT/SPLIT, Bandwidth setting, and Transmit output. Memories can be returned to the factory defaults by pressing the

Memory	Frequency (kHz)
1	1850
2	1950
3	3700
4	3900
5	7040
6	7140
7	7239
8	10105
9	10125
10	14050
11	14150
12	14300
13	18100
14	18150
15	21050
16	21350
17	24900
18	24950
19	28200
20	28450

Table 3. Factory default memory presets (note: Channel numbers are not assigned or displayed).

CMD+Split	Function	LCD Display
Not activated	No noise reduction	No colons
Press once	Original ADSP (13 dB)	One colon
Press twice	ADSP2 (26 dB)	Two colons

Table 4. Initiating ADSP2 noise cancellation.

CMD+BMW	Function	LED Bar Graph
Not activated	No filters	No LEDs
Press once	1800 Hz bandwidth	Three red LEDs
Press twice	500 Hz bandwidth	Two red LEDs
Press three times	100 Hz bandwidth	One red LED

Table 5. The initiating process and enhanced bandwidth filters activated by a combination of the CMD+BW keys. Note: Each activation steps to the next filter or DSP level in a loop. For example, the ADSP2 will step through 13 dB reduction, then 26 dB noise reduction, and then back to no noise reduction. The ADSP and filters can be used in any combination.

MEM button while turning the power ON. New memories are stored by first tuning the frequency, setting the mode and other parameters, and then pressing and holding the FAST button and pressing the MEM button. This will overwrite whatever information is stored in that particular memory location with the new information. You go from memory location to memory location by pressing the MEM button and turning the main tuning knob to the desired frequency. A simple chart showing those frequencies you have set up will be helpful — remember, the channel numbers are not assigned, and therefore not displayed. There are merely 20 user-accessible locations.

- **BW (Bandwidth).** Pressing the BW button will display the receiver bandwidth on the LCD. Turning the main tuning control while holding the BW button will change the bandwidth in 100-Hz steps from 100 Hz to 2.7 kHz.

- **Mode Selection (BW+REV).** To display the current operating mode (CW/USB/LSB) press BW. To select another mode, hold BW and momentarily press REV until desired mode appears on the LCD. Release BW to return to the frequency display.

Secondary switch functions

- **Bar Graph Mode (CMD+LIGHT).** Pressing the CMD and LIGHT simultaneously changes the bar graph display from “full” bar to “peak” bar display.

- **DC Input Voltmeter (CMD+Speed).** Pressing and holding CMD and SPEED simultaneously but momentarily will cause the LCD to display DC input voltage. This will be displayed until you: (a) move the tuning knob; (b) initiate transmit in CW mode; or (c) depress any of the following keys — CMD + any other key, SPEED, PBT, MEM, or BW.

- **TX Output Power Adjust (CMD+NB).** Pressing and holding CMD and NB simultaneously but momentarily, the TX power level is adjustable by turning the main tuning knob. Adjustments can be made in increments of approximately 1 watt from 0 to 20 watts. To enter this setting in the last recalled memory, you would press

FAST+MEM. To return to the frequency display, press MEM. Accurate calibration is NOT supported.

- **MEM SCAN (CMD+PBT).** Pressing and holding CMD and PBT simultaneously but momentarily will initiate a scan of the 20 memories. To stop the scan, press any button or transmit. The scan variables (Dwell, Pause, Detection Threshold, Audio Blanking Time and Frequency Steps) are adjustable via CMD+REV.

- **ADSP2 NOISE CANCELLATION (CMD+SPLIT):** The latest variation of ADSP is activated by a combination of the CMD and SPLIT keys. Hold down the CMD key, then press the SPLIT key and release both. The degree of noise cancellation is determined by the commands issued as shown in **Table 4**.

- **ADSP NOISE CANCELLATION (ORIGINAL), CMD+BW.** The original ADSP was initiated in either an On or Off mode (13 dB reduction) by pressing the CMD+BW keys.

Transceiver in general

All in all, you get a great deal of radio in a small package for a reasonable price. But, now that we’ve explored some of the highlights you do get, let’s take a look, warts and all, at some of the things you don’t get. And if they aren’t there, do you really need them?

What you don’t get with the SG-2020 (or, Do you really need them?)

- **FM Operation:** The SG-2020 does not permit FM operation, but is it really a must-have on a small transceiver that covers 160 through 10 meters? I didn’t think so; all that would be lost is some activity on 10-meter FM, which frankly I have yet to hear, or for that matter get too terribly excited about doing. The same argument, with a bit of qualification, could be made about VHF/UHF capabilities. There’s just so much technology you can cram into a small box and have it work well, and most important, dependably. I prefer to reserve VHF/UHF communications for the main station rig (ICOM 746 PRO or the van’s ICOM 706 MKIIG). What I wanted, and the SGC-2020 provided was a portable rig I could take

But Does It Work?

Reviews are usually crammed full of specifications, tables, theories of operation, and the like, but no matter what the text says or the meter reads, the proof of the "pudding" is in how well the item works, or how badly it worked in actual use.

My experiences with the SG-2020 have been excellent to say the least. The review article mentioned a contact on 160 meters, which gives you an idea of how well it works in a worst-case scenario, but let's look at, for lack of a better term, a "best-case scenario." Specifically, the diary of a QRP contact with Asiatic Russia.

On the date in question, 23 September 2002, 0230 UTC, I was seated in my shack and had just connected my SG-2020 to the best antenna in my antenna "patch," a B&W wideband (160–10m) dipole at some 30 feet pointed north/south. I allowed a few minutes warm-up time on 20 meters while I found a pencil, some paper, and a cup of hot coffee, and began to tune around the band listening for DX stations.

I'd previously set the power out on the SGC-2020 to an indicated 5 watts so that any contact I made would indeed qualify as a QRP SSB contact. I verified the power out setting one more time and heard a strong signal — UA9CUA calling QRZ — and the usual collection of rascals forming a pileup.


I reached for the microphone and gave my call "Whiskey Four Poland Germany Italy QRP" twice. To my amazement, Fred UA9CUA in Krasnouralsk, Russia, returned with "Only the QRP station, please." To my further amazement, the other hams relented and I established contact with Fred, and exchanged pleasantries and signal reports.

He was a solid 5/8-9 into Smyrna, Georgia, and he reported my signal as 5/4 and very easy to copy in Russia. I dashed off a QSL to his US QSL manager and didn't think a lot about it until I checked the map and realized just how far I'd reached out with an indicated 5 watts SSB.

Some time later, I received his QSL card. At that point it really sunk in, and I tried to determine just how far in miles he actually was from my QTH, which was no easy matter. Once I'd arrived at a figure, I determined that I'd probably qualified for the 1,000 Mile per Watt Achievement Award. I sent off a copy of my QSL together with the necessary paperwork, and received the certificate.

According to the Awards Manager, my QSO amounted to 1,468 miles per watt, the distance from the home QTH at 33.52N, 84.40W, and Fred's location at 31.6N, 60.04E.

Well, it appeared that the SG-2020 not only could hear signals from afar but could at relatively low power transmit as well. Not wishing to rest on my laurels,



RUSSIA
OBL 154 WAZ 17 ITU 30

UA9CUA

FRED MUZYKA

W4PGI / QRP

Date	UTC	MHz	2x	RST
23 Sep 02	0243	14	SSB	54
Tnx QSL -- Joe				

QSL MGR
W3HNK

PSE QSL TNX via bureau or direct;
P. Box 22, 624330, Krasnouralsk, Russia

Photo SA. QSL card from Russia.

even though the award is framed and prominently displayed on the shack wall, I tried my hand at PSK31 using a suitable interface and my laptop computer. SGC recommends not operating in the PSK31 mode above approximately 10 watts.

I played it safe, and on my first contact worked into Canada using an indicated (again) 5 watts. I received a 5/9 signal report on my first QSO, and similar reports later that day from stations in Pennsylvania and Nevada on 20 meters.

So if operation is the key to how well a rig works, then take it from me and my certificates, the SG-2020 works extremely well and has continued to do so at a variety of power levels, on different frequencies, and without resorting to high-gain directional beam antenna farms — just my lowly dipole and once or twice a Hamstick in the car.

Naturally, your results may vary, but definitely get your hands on the SG-2020 and try this at home. You'll be glad you did.

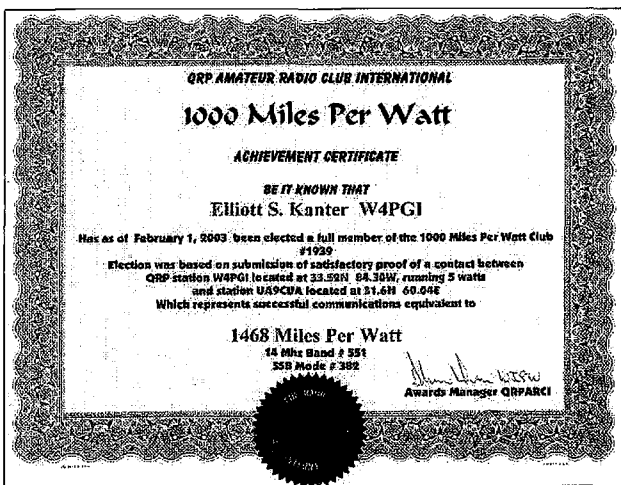


Photo SB. This certificate represents a 1,468 miles-per-watt QSO.

General	
Operating modes	USB, LSB, CW
Receiver frequency range	400 kHz to 29.7 MHz; however, receiver display will be slightly uncalibrated below 1.6 kHz
Transmit frequency range	1.8 to 29.7 MHz (U.S. ham bands only)
Export version capable of general coverage transmit	1.8 to 30 MHz
Operational temperature range	-30 to +70 °C
Microprocessor	MC68HC711E9
Frequency stability	3 ppm per 10 °C; example — at 14.2 MHz, equal to $14.2 \times 3 = 42.6$ Hz, a total frequency drift of 42.6 Hz for a temperature change of 10 °C; i.e., if the temperature changes from 20 to 30 °C, there could be frequency drift of 42.6 Hz
Frequency resolution	10 Hz steps
Frequency display resolution	100 Hz steps
Receive transmit changeover	Less than 10 milliseconds
User-friendly functions	SPLIT, RIT, XIT
Memories	20 simplex or semiduplex
SWR metering	Built-in
LCD display	Backlit
Keyer	Fully adjustable iambic B mode keyer operating under microprocessor control from 5 to 60 wpm
Dimensions	2.75H x 5.9W x 7L inches
Approx. wt.	4.4 lbs.
Microphone	Fist, dynamic, included (comparable to Kenwood MC43 or similar)
Battery voltmeter	Digital, front-panel-controlled
Receiver	
Sensitivity	Better than 0.3 µV for 6 dB S/N
Intermodulation	+18 dBm 3rd order intercept
Tunable AF bandpass	100 Hz to 2700 Hz
Audio output	1 watt RMS
AF distortion at nominal output power	Less than 3%
Noise blanker	Front-panel control
RF gain control	Front-panel control
BFO	Microprocessor-controlled
Typical consumption in receive mode	Less than 500 mA*
Transceiver	
Transmitter power	Adjustable from 0 to 20 watts PEP output, with efficient operation at 5 W
RF speech processor	VOGAD baseband processing and RF clipping
Transmit current	5W CW; less than 2.5 A*; 20 W CW; less than 4 A*
Transmit intermods for 20 W PEP	-28 dB or better
Transmit spurious and harmonics	50 dB (from PEP power) ham bands
*Note: Current measurements were made with a DC supply of 13.7 V using a 3-1/2-digit DVM and take into account all available options (e.g., panel lamp and ADSP2 active, volume at comfortable room listening level). Your actual measurements may vary.	

Table 6. Specifications. *Note: Current measurements were made with a DC supply of 13.7 volts using a 3-digit DVM and take into account all available options (e.g., panel lamp and ADSP2 active, volume at comfortable room listening level). Your actual measurements may vary.

nearly anywhere, operate off a gel-cell battery, and have fun with, not to mention use fixed as a QRP rig.

- **Bandswitching** — or at least a more conventional method of going from one band to another. It would be nice, but in reality, how many different frequencies do you operate on in each band? If you look back at **Table 3**, you can get a lot of mileage out of the factory-default memory settings. If not, you have a total of 20 memory positions for programming your favorite “watering sites,” and the ability to tune between them. For me, I have considered loading the QRP and Pedestrian Mobile frequencies into memory and going from there. The lack of a quick bandswitching scheme is hardly a defect. If you are spoiled by one-button access, then you actually have a pseudo-one-button access by pressing the MEM button and turning the main tuning knob to go from one memory channel to another — no big deal.

- **VOX:** A voice-operated relay would be nice, but having that feature on both my main and mobile rigs, I’ve discovered that at times it’s not all that helpful, especially with high background noise and false activations or dropouts. Again, it would be nice, but for years hams used push-to-talk, and with a rig this feature-laden, I would be loath to give up a must feature for one that is merely a convenience — sometimes.

- **Speech Compressor:** Most rigs have them, many hams misuse or misadjust them, and the VOGAD speech compression present in the SG-2020 has proven to me that it’s not a carved-in-stone necessity. In fact, about two months ago in the early evening, I fired up the 2020 on 160 meters, full QRO (all 20 watts give or take a microwatt), and tried a CQ. Now, later I found out that what I did took guts. Most people on 160 are running a good deal of power, and very few of them run what could best be described, at least on 160, as QRP. To make a short story a bit longer, I had a station in southern Illinois come back to me with this comment: “I had to come

Continued on page 54

Study Guides That Pass the Test

Presenting a review of the best books on basic radio.

Being interested in radio, we should be well acquainted with the basic principles and have a broad understanding of radio circuits. Whether a hobbyist, experienced engineer, or technician, we can always increase our knowledge through understanding.

Enjoyment of radio can be improved when we feel comfortable with “how” and “why” radio works. Whether you have had a lifetime of experience or are just starting out, sometime facts or theory or fundamentals are just a little fuzzy and in need of review. Perhaps you have just forgotten some details.

Of course, our favorite hobby magazine, our friends with similar interests and “Elmers” are invaluable resources. But no matter what resources we use, most often we turn to a good textbook for help and in-depth study. Have you ever wondered about the best basic radio textbooks available for study and reference?

Radio expanded at a phenomenal rate once it took hold. By the late 1930s authors were writing volumes with an improving knowledge of basic radio. Today, radio is well understood, and many textbooks have been written since that early beginning. In fact, so many books have been written that finding just the right one for study can be an arduous task. Most of us have relied heavily on textbooks for study and learning radio technology. But not all textbooks, or authors, are created equal. Therefore, a review of some of

the most recommended textbooks for our hobby, both current and otherwise, should be of interest.

A major commitment to reading and understanding is time. One has to ponder theory and concepts before understanding emerges. In our busy lives, some discipline is required to allocate blocks of time to study. It is my hope that this discussion will shortcut the process by helping select textbooks worthy of your valuable time.

Many textbooks on the basic principles and theory of radio have been studied and reviewed. The intent was to find textbooks that are standouts. Analysis included the author’s approach that must assume one was acquainted with intermediate electrical principles but struck a balance between introductory material and more complex subjects. To be recommended, the textbook must hold your attention and be interesting.

In addition, having been associated with modern electronics and education for many years, a need was established to improve my own understanding as a collector and restorer of vintage radios. This study helped not only to electronically restore them, but to improve my understanding of how they

worked. Thus, my study necessarily included tube-type classical theory, which transferred to modern solid-state theory as well.

Some may view a study of classical textbooks as a waste of time, but I assure you it will only improve your understanding and enjoyment of radio. One can visualize the evolution of radio by studying the classics. Our roots are grounded in the classical technology. To be a well-rounded amateur, we should know vacuum-tube basics as well as modern solid-state technology. After all, the basics of radio hold up whether you are discussing classical or contemporary. Good classical textbooks were not excluded from this study just because their discussion centered on vacuum-tube technology.

During my study of the current and classical textbooks, some seemed to be much better than others in explanation and clarity. A large cross-section of texts was selected for study. Trying to cover the most popular contemporary, and classical radio textbooks is a difficult task. Since radio came on the scene, many textbooks have been written. My selected list is certainly not exhaustive, but included those most popular and available today. Each will

not be critiqued here, but only the top group recommended by my colleagues and me.

In addition to textbooks, numerous home radio course-books or manuals are still available and can be studied. After WWII, many schools offered mail correspondence courses aimed at veterans. Being offered within correspondence courses, many people, hoping to enter radio and TV repair, got their introduction to radio. These are worthy of your consideration as well, but will not be reviewed or considered here. Some of the more popular were National Radio Institute, Cleveland Institute of Electronics, DeVry Institute, Christy Trades School, and Coyne Electrical School.

While some of the textbooks listed here were not written strictly for the purpose of an in-depth study, they were written as a quick introduction review for radio repair and restoration. They were included in the list as they have merit as well. Perhaps it is a bit unfair to include them in the broad range of textbooks, but again, the purpose here was to review those currently available to the hobbyist.

One of the main characteristics of a good "radio basic principles" textbook is its ability to explain tuned circuits, resonance, detection, and amplification. A good explanation of basic circuits is also desired. Since this is at the heart of radio, it was the main criterion for

judgment. Many have daunting math, which was obviously written for engineers, but I have assumed a less vigorous approach is desired. Of course, some math is required as it quantifies the discussion. However, taking more of a subjective approach made some textbooks more favorable. Also, text readability is important.

Below, the textbooks considered are listed in order of recommended preference. After the top ten, the order has little meaning, as they become about equal in quality. A critique and comments about the top candidates follows:

Starting with the best, *Elements of Radio*¹ by Marcus and Horton is highly recommended. This text had by far the best clarity of discussion and was detailed enough to explain without being too elementary. The pace is right and will keep your interest. Although the text is dated, it compared well with contemporary publications. Of course, it does not cover solid-state subjects, but this is not a disadvantage as the basic theory translates well. One can bridge to solid state with some supplemental reading. The figures, illustrations, and examples exactly illustrate the discussion. The topic organization lends itself to logical progression, making theory discussion easy to follow. The math is minimal, used only where necessary to quantify a point or explain. The best discussion of resonance, tuned circuits, and antenna theory (radiation)

was found in this book. Figures and illustrations were almost always on the same page as the discussion. This may sound trivial, but trying to follow theory and discussion from figures on a different page can be frustrating. I keep this important book nearby as a reference. If you read and study no other text, read this one.

The second recommendation is the *Learn Electronics Through Troubleshooting*² by Lemons. Using theory and basic principles from the point of view of troubleshooting makes good sense. I found this an excellent tie to the principles and certainly an excellent supplement to *Elements*. Using two-color graphics, figures, and illustrations make the points clear and understandable. By the use of cause and effect, the discussion leads you to the basic principles. This text also includes an introductory chapter on solid-state radio.

*Essentials of Radio*³ has some of the best analyses, especially of series and parallel resonance circuits. It is a comprehensive, detailed textbook covering the critical topics, but requires patience to get through it. Having over 800 pages of small print will take more than an afternoon of reading. It also has somewhat of an engineering slant, and requires careful study. Even so, the book is useful even to the casual reader as it is not all that difficult to understand.

One of my favorites is *Basic Radio Course*⁴ by Frye. It is a fun read. The basics are covered using an unusual colloquial and humorous style. This is a very readable text using good analogies to explain the concepts. If you are new to radio, perhaps this would be a place to start. Frye makes study fun as well as gives outstanding illustrations to his explanations. Only minor reference to math is used. However, lacking some detail, it left me wanting more and a little unsatisfied. You may remember John Frye, as he authored the series "Carl and Jerry" for the early issues of *Popular Electronics* magazine.

*Electrical Essentials of Radio*⁵ is less comprehensive than the other Slurzburg books. Written for the reader with limited math background who is interested in the introductory



Photo A. For your education in the basics of amateur radio, these books are the best of the best, according to K5MLG.

principles, this would be a good beginner's book. Written prior to *Essentials of Radio*, which made extensive use of circuits and circuit design, it provides a foundation background to further study.

*Basic Radio, Principles & Technology*⁶ by Poole is one of the more contemporary offerings. It could be used as a supplement to bring modern circuits in alignment with the classics. I found it too brief with its discussion of resonance and tuned circuits. "Why" a circuit worked was not addressed well. A strong discussion of modern circuits and components makes it useful in understanding today's technology.

Understanding Radio's⁷ approach may be too elementary for some. It uses a simplistic explanation of circuit analysis but good visualization. If you need to start with a rudimentary text, perhaps this one could be your introduction. Do not sell this book short; although dated, it has much to offer. In detailed simplistic terms the book explains how a circuit functions and why it works. The authors present some of the better explanations of resonance, crystal-controlled oscillators and microphones. Detail on "how to build a circuit" seemed to get in the way of the discussion, however.

Do not overlook the handbooks. ARRL's *The Radio Amateur's Handbook*⁸ and Bill Orr's *Amateur's Handbook*⁹ have excellent discussions relating to how to use the basics in circuits. I found them short on "why and how" a circuit works. Again, these are good references and probably would not make an evening's reading. But glean the basic topics for review and keep them handy for reference.

*Radiotron Designer's Handbook*¹⁰ is the bible for many tube-type aficionados. It has excellent design features and explains well. It was printed in several editions and two different versions: the black volume with 352 pages and the voluminous red volume with 1498 pages. The "handbook" may be a little intimidating for some by its sheer size and its extensive use of math. But if you can stay with it and glean from specific topics, an outstanding reference for all expects of

radio circuit design is yours. Perhaps more for the engineer, the handbook is comprehensive and covers more than basic radio. After all, its purpose is to be a design reference. This book seems to be in great demand as it commands a high price, used.

Another set of textbooks worthy of your study and supplemental reading come from the U.S. Department of the Navy.¹¹ Several reprints and editions have been made available over the years. The most recent reprint was published by Dover¹² in 1978 and continues in print. The USDPN revised the text in 1972 making it one of the more contemporary textbooks covering nearly everything from DC to light. Well-written for a beginning study.

My intent here is not to disparage any of the textbooks listed as all have much to offer and would be well worth your time to explore. Simply some would not be offered, as a "first reading" because they tended to either be tedious and unclear on points or they lost my attention in discussion. Certainly, I would encourage reading any and all texts available to you, as it will only enhance an understanding and enjoyment of radio. Whether you are a beginner, an old-timer, or an engineer and want to maximize your radio experience, I recommend starting with these top textbooks.

Try to acquire the top reviewed books. Your radio library should not be without them. Most all those in this article were acquired in the past five years and my personal survey indicates most are still available. Your local radio organizations, auctions, the Internet, the library, or your local swap meet would be good sources to explore. Try [<http://www.bookfinders.com>] or [<http://www.eBay.com>]. Keep on the lookout for a basic radio textbook when you visit a hamfest or radio trade day. If an opportunity occurs to pick up any interesting radio textbook, I would encourage you to take advantage and add it to your library. Many turn up at bargain prices. Read and learn from the masters.

If there have been some obvious candidates excluded or your favorite is not on the list, please let me know. I

would like to hear from you. My hope is that you will derive some pleasure from reading and studying a good textbook and get excited about this wonderful phenomenon known as RADIO!

References

1. *Elements of Radio* (second edition) by Marcus and Horton; Prentice-Hall, 1950.
2. *Learn Electronics Through Troubleshooting* by Lemons; Howard Sams, 1971; ISBN 0-672-20651-X.
3. *Essentials of Radio* by Slurzberg and Osterheld; McGraw-Hill, 1948.
4. *Basic Radio Course* by John T. Frye; Tab Books, 1961; ISBN 0-8306-1104-5.
5. *Electrical Essentials of Radio* by Slurzberg and Osterheld; McGraw-Hill, 1944.
6. *Basic Radio, Principles & Technology* by Poole; Newnes, 1999; ISBN 0-7506-2632-1.
7. *Understanding Radio* By Watson, et al.; McGraw-Hill, 1940.
8. *Radio Handbook* (twenty-second edition) by William Orr; Howard W. Sams & Co., Inc.; 1981; ISBN 0-672-21874-7.
9. *The Radio Amateur's Handbook* (annual editions, 1940s to date), ARRL.
10. *Radiotron Designer's Handbook* edited by Smith; third and fourth editions (black and red editions), Wireless Press, RCA, 1945, 1953.
11. *Elements of Electricity and Radio*, U.S. Navy course, 1944; reprint by Antique Electronic Supply, 1999.
12. *Basic Electronics (Vol. 1)* by Bureau of Naval Personnel; U.S. Government Printing Office; Cat. # D 208.11: EL2/10/971/V.1; revised 1972. Also published as reprint by Dover Publications, NY; 1977; ISBN 0-486-21076-6.
13. *Grob Basic Electronics* (seventh edition) by Bernard Grob; Macmillan/McGraw-Hill, 1992; ISBN 0-02-800762-X
14. *Radio Physics Course* by A. A. Ghirardi; Murray Hill Books, Inc., 1942.
15. *Basic Radio* by Hoag; D. Van-Nostrand, 1943.
16. *Modern Radio Essentials* by

Continued on page 54

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the November issue, we should receive it by August 31. Provide a clear, concise summary of the essential details about your Calendar Event.

SEP 6

SPENCER, IN The Owen County Amateur Radio Assn. and the Bloomington ARC will co-sponsor the Owen County Amateur Radio Hamfest on September 6th, 2003. For more info contact *Katie Smith K9INU* at 812-829-2140; or *Carl Zager* at 812-339-4437.

SEP 12, 13

BENTONVILLE, AR The B.C.R.O. Hamfest will be held at Thomas Jefferson School, 810 Bella Vista Rd., Bentonville AR, Saturday 8 a.m. to 1 p.m. Setup is Friday night at 6 p.m. VE exams at 10 a.m. Saturday. Talk-in on 145.290 down 600. Admission \$3. Tables \$5. Tickets are two for \$5. Food and drinks available. Contact *Betty Weiberg* at 417-435-2332 or by E-mail at *[jweiberg@leru.net]*; call *Shirley Harris* at 479-451-8626; E-mail *[saharris@centurytel.net]*; or *Buster Morrow* at 479-631-9231. E-mail *[ad5am@mc2k.com]*.

SEP 13

GRAND RAPIDS, MI The Grand Rapids ARA will present "GRA Hamfest 2003" at the Forest Hills Northern High School, 3801 Leonard St. NE in Grand Rapids, 8 a.m. until it's over. Directions: Hwy. I-96 exit #38 / Hwy. M-44, north 1 mile to Leonard St., turn right (east). This is a flea market/ swap meet featuring electronics, ham radio, CB, shortwave equipment and computer equipment. VE exams at 10 a.m. Contact *Ed Novakowski N8UXN* by E-mail at *[hamfest@w8dc.org]*, or evenings call 616-458-9029. Check the Web page at *[http://www.w8dc.org/swap.html]*. Talk-in on 147.26(+) 94.8 Hz and 146.52 simplex. ARRL-sanctioned.

SYRACUSE, NY The Radio Amateurs of Greater Syracuse (RAGS) presents its 48th annual Hamfest from 8 a.m. to 2 p.m. at the Pompey Hills Fire Department, Saturday, September 13th, rain or shine. Take I-81 exit #15 on to Route 20 East. Go 6 miles to Henneberry Rd. on the left. Forums, prizes, ARRL. VE walk-in exams at noon. Admission \$5 or 16 years and under free. Buy and sell ham radio, computer equipment, and more. Rent an indoor flea market space with an 8 foot table for \$12, or bring your own table for only \$5. Breakfast starts at 7 a.m. Lunch will be served later. This location is 1400 feet above average terrain so bring your mobile rig

and work some DX. Talk-in on 147.90/30 MHz. Telephone 315-698-4558, or write to *RAGS Hamfest, Box 88, Liverpool NY 13088*. E-mail through *[ragsinreview.com]*.

SEP 14

NEWTOWN, CT The Candlewood ARA of Danbury CT will hold their Western CT Hamfest on Sunday, September 14th, at Edmond Town Hall. Directions: Rte. 6. Exit 10 off I-84. Follow the signs. Talk-in on 147.300(+) PL 100. New equipment dealers, flea market, tailgating, electronics, computers, refreshments. Tables \$12.50 each (includes 1 admission). Tailgating \$8 (includes 1 admission). Admission \$5, children under 12-years-old admitted free. For reservations and info, contact *John M. Ahie W1JMA*, 120 Fire Hill Rd., Ridgefield CT 06877. Call 203-438-6782; or E-mail to *[W1JMA@arrl.net]*.

SOUTH DARTMOUTH, MA The Southeastern Massachusetts ARA, Inc. will hold its annual flea market on the club's grounds at 54 Donald Street in South Dartmouth. The event will run from 7 a.m. to 12 noon, rain or shine. Talk-in on 147.00/60. Admission \$2 (spouse and children free). Walk-in VE exams at 10 a.m. Free space and admission for vendors. For more info go to *[www.semara.org]*, or contact *Tim Smith N1TI* at 508-758-3680. E-mail to *[rt_smith@yahoo.com]*.

SEP 20

ROLLING MEADOWS, IL The 51st Annual W9DXCC Convention and Banquet will be held Saturday, September 20th at the Holiday Inn (near O'Hare Airport) in Rolling Meadows IL. Come early. There will be a Friday Welcome Reception hosted by Carl Smith N4AA and DX Publications, followed by a Hospitality Suite late Friday. This will be hosted by the Northern Illinois DX Assn. Stay late on Saturday night and enjoy the Saturday Night Hospitality Suite hosted by the Greater Milwaukee DX Assn. Other features will include presentations by major DXpeditions, an ARRL forum, Grand Banquet and prizes, and DXCC QSL card checking. The Master of Ceremonies will be Jim O'Connell W9WU. For more info contact *Bill Smith W9VA* by calling 847-945-1564; or E-mail to *[w9va@aol.com]*.

SEP 25-28

SEATTLE WA Microwave Update 2003

organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25-28, 2003. Registrations for the joint conference will be accepted beginning April 1st. Cost of the registration will be \$40 prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be \$50. Registration forms can be downloaded at *[www.microwaveupdate.org]* or send an SASE to *John Price N7MWV*, 12026.81st Ave. NE, Kirkland WA 98034, and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to *Microwave Update 2003*. Joint conference sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are \$69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at 425-337-2900. Be sure to mention "Microwave Update" to get this rate. Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to *Jim Christiansen K7ND*, via E-mail at *[k7nd@att.net]*. MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to *NU7Z* *[nu7z@aol.com]*. For presentations at the Pacific Northwest VHF Conference sessions, contact *N7CFO* at *[n7cfo@ix.netcom.com]*. LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice.

OCT 5

MEDINA, OH Join the M2M Medina Amateur Radio group at the Medina County Career Center, 1101 W. Liberty St. (State Route 18) from 8 a.m. to 2 p.m. to have fun at the Medina Hamfest. The Grand Prize being offered is a mobile rig and antenna setup. Also featured will be a 50/50 raffle, VE exams, ladies' door prizes, computer equipment and new and used ham gear. All indoor tables and spaces. For general questions about the hamfest, call *Mike N8TZY* at 330-273-1519 after 7 p.m., or E-mail [n8tzy@m3net.net]. For VE exam info call *Fred K8FH* at 440-236-3477. Walk-ins are always welcome. Testing starts at 9 a.m. Hurry in and don't be late. Inside vendors tables are \$9 each in advance or \$11 each after Sept. 29th. Inside flea market spaces are \$7 each in advance or \$9 each after Sept. 29th. Send your remittance to the *Medina Hamfest Committee, P.O. Box 452, Medina OH 44258*. Remember to enclose an SASE for return of tickets. Advance reservations must be received by 09/29/03. All tables will be held until 9 a.m. on the day of the show. If you have any special requests, please let us know and we will try our best to help.

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens NY. Doors open for vendors to set up at 7:30 a.m. Buyers admitted at 9 a.m. Free parking, door prizes, food and refreshments. VE exams at 10 a.m. Admission by donation, buyers \$5, sellers \$10 per space. Talk-in on 444.200 rptr, PL 136.5; 146.52 simplex. Web site [www.qsl.net/hosarc]. For further info, call at night only, *Stephen Greenbaum WB2KDG 718-898-5599*, E-mail [WB2KDG@arrl.net]; or for VE exam info, call *Lenny Menna W2LJM* at 718-323-3464, E-mail [LMenna6568@aol.com].

OCT 12

WALLINGFORD, CT The Meriden ARC, Inc. will hold the 11th Annual Nutmeg Hamfest and Computer Show, featuring the 2003 American Radio Relay League State Convention, on Sunday, October 12th, 9 a.m. to 3 p.m., rain or shine, at Mountainside Special Event Facility, High Hill Rd., Wallingford CT. Exit 15 Rte. 91 (North or South). Follow signs. Info is available on the Web site at [www.qsl.net/nutmeghamfest]; or we can be contacted by E-mail at [nutmeghamfest@qsl.net]. General admission is \$7. Children under 12 are admitted free and must be accompanied by an adult at all times. Proceeds from the event will help support public service, scholarship and civic activities. Indoor booth space with 8 ft. table and chair is \$30. Outside space \$20. If you pay in full before Sept. 12th, deduct \$5. Make payments to *Nutmeg Hamfest* and mail to *Andy Purchia N1XXU, 116 Kensington Ave., Meriden CT 06451*. Phone 203-235-8440. Talk-

in on 147.36. Major vendors will be present, including *KJI Electronics*, *Lentini Communications* and *Battery Tech*. For VE exam info call *Joel Corneal N1JEO, 203-235-6932*.

OCT 25

RICKREALL, OR The Mid-Valley ARES is proud to present its 9th Annual "SWAP-TOBERFEST" Amateur Radio Emergency Services Convention. The convention will be held on Saturday, October 25th at the Polk County Fairgrounds in Rickreall OR, west of Salem where Highway 22 meets 9W. Doors will be open for the convention from 9 a.m. to 3 p.m. the day of the event. Swap table setup will be from 6 to 8 p.m. Friday night, October 24th, and on Saturday morning, October 25th, at 7 a.m. Self contained RV spaces are available for camping at \$12 per night. Talk-in on the 146.86 rptr. (186.2 PL). Features include swap tables, commercial dealers, meetings and seminars. Additionally, emergency communications vehicles will be on display from Marion and Polk County Emergency Management, Civil Air Patrol, American Red Cross, and others as available. For more info contact *Shane Kuehl W0SPK, 503-589-0496*, or E-mail to [w0spk@arrl.net]. To print a copy of the flyer and pre-registration form, the URL is [http://home.earthlink.net/~kd7bcv/Swaptoberfest2003/Swaptoberfest_2003.html]. Tickets are \$5 each in advance or \$7 at the door. No-power swap tables are \$18 (includes one registration). Additional no-power swap tables are \$13 each. Tables with power are \$20 each (includes one registration), additional power swap tables are \$15 each. Pre-registration tickets can be picked up at the front door at 7 a.m. Saturday morning. If you require written confirmation of your pre-registration, or your tickets by return mail, please include a self-addressed stamped envelope and mail to: *Mid-Valley ARES, P.O. Box 13848, Salem OR 97309*. Make checks or money orders payable to *Mid-Valley ARES*. Only 2 pre-registered participants will be allowed per table during setup. All participants must register (unless 12 or under in age). Disabled hams who have pre-registered may enter SwapToberfest at 8:30 a.m. through the East door. One pre-registered assistant, to offer a helping hand, is allowed per disabled ham. Drawing rules: You need not be present to win the Early Bird (ICOM IC-Q7A Dual-band Handheld; or Grand Prize (ICOM IC-T90A Dual-band handheld); you MUST be present to win the hourly drawings; no purchase necessary; limit one entry per person. The Amateur Radio Emergency Services Convention is being sponsored by members of the Polk County ARES (W7PLK) — Emergency Coordinator, Bud Smith N7BUD; and the Oregon Emergency Management ARES/RACES Unit (W7OEM) — Emergency Coordinator, Shane Kuehl W0SPK.

OCT 26

CANTON, OH The Massillon ARC will hold their Hamfest Sunday, October 26th, 8 a.m. to 3 p.m. at Stark County Fair Grounds, 305 Wertz Ave. NW. From I-77 take downtown exit, turn left (west) on W Tusc. Turn right on Wertz to fairgrounds. From I-77 S, take the 4th St. NW exit, turn right (west) into grounds. Setup is at 6 a.m. Admission is \$5. 8 foot tables with electric, \$12. Handicap accessible. Free parking. Talk-in on 247.18(+). For tables, contact *Terry Russ N8ATZ, 3420 Briardale Cr. NW, Massillon OH 44646*. Visit [www.marcrado.org].

SPECIAL EVENTS, ETC.**SEP 27**

RAYMOND, ME The U.S. Coast Guard Auxiliary D1NR Radio Raymond, K1G. 1300Z-2100Z Sep. 27th. 64th USCG Auxiliary, 25th Canadian CG Auxiliary anniversaries and ISAR Special Event Radio Day (VO1RAC). 28.320, 21.310, 14.260, 7.260. CGA Certificate. Contact *Keith C. Morton W1NDH, P.O. Box 809, Raymond ME 04071-0809*. 73

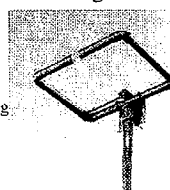
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"Let's have a picnic! We'll E-mail all our family members and some of our friends to meet us at Podunk Park next Saturday. Bring your softball bat and glove, we'll have a 3-legged race, and I'll have some direction finding gear to demonstrate foxhunting."

That sounds like fun, doesn't it? But in Orange County, CA, this might be the start of an illegal act. Some officials apparently think so, with or without the foxhunting demo. I discovered this the hard way a few days ago, and right now I'm worried that it may be true in many other places. You'll want to know why, and I'll tell you shortly, but first a bit of background.

For several years, "Homing In" has

encouraged readers to get their clubs into on-foot transmitter hunting (also called foxhunting, fox-tailing, radio-orienteering and ARDF). Practice sessions in local parks are an ideal way to start. I have been putting on such sessions informally several times a year here in southern California, in addition to more formal events at hamfests and conventions. We've been in 12 different parks so far.

Unlucky 13th

As in many other places around the country, local fox-tailers are in training for the Third USA ARDF Championships' as I write. Last week, I scouted out an Orange County park that we've never used for radio-orienteering before. It seemed ideal for a championship training session because there are about six miles of trails around a

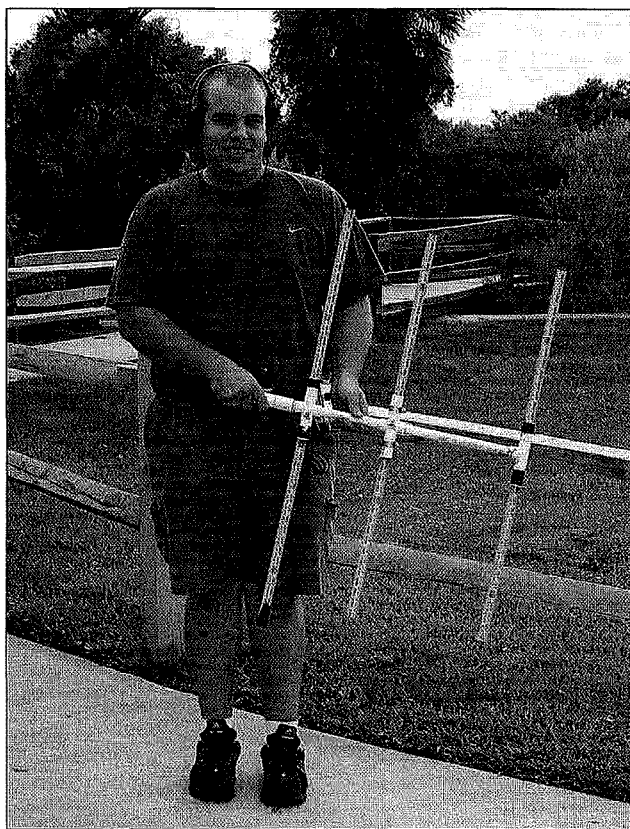


Photo A. Tim Van Nes N9EL won the first Daytona ARDF event using a steel-tape yagi for two-meter foxhunting. Plans for this antenna are on the Web. (All photos by John Munsey KB3GK)



Photo B. It looks like John Greiff N4UJU used a shortened version of his mobile two-meter quad for this on-foot foxhunt. He found all the foxes and took second place.

reservoir and canyon. However, much of the off-trail area is off-limits because it's a wildlife refuge. I knew that the ranger might be concerned about potential damage to this environment, so I sought him out.

At first, the ranger was cool to the idea of a dozen hams running the trails and looking for green ammunition boxes with transmitters in them. But after a while, we came to an agreement. I promised to instruct the hunters to stay on the trails and not look for foxes beyond a few feet away. He agreed that we could do the event and we exchanged contact information. I went home to put out an E-mailing and to promote the event on local repeaters.

Two days later, I got E-mail from the ranger. "I called the county permit office to clarify the regulations concerning permits," he wrote. "My contact said that since you are doing an activity and not merely sitting under a tree talking, a permit is needed to protect the county's liability interests."

"It's not hard," he told me when I immediately phoned him in disbelief. "You should have applied 20 business days before the event, but now you can fill out the form I attached, take it to the county seat during

business hours, pay the \$56 filing fee, and show evidence of insurance indemnifying the county." He made it clear that he was withdrawing his approval of our session until I got clearance from that office.

Confident that I could convince the permit purveyors that an informal ARDF practice session would be "under their radar" just as a 3-legged race at a family picnic would be, I called the permit clerk supervisor per the ranger's directions. No such luck. In her eyes, this was a "competitive" event, thus requiring a permit. She agreed that rangers don't usually boot families out of parks for having 3-legged races and softball games, but she wouldn't budge on the need for a permit for ARDF. After several minutes of back-and-forth, she kicked the matter up to the county's manager of harbors, beaches, and parks.

"How do you win at radio-orienteeering?" the manager asked after I gave him a brief explanation of what we'd be doing. I replied that the winner finds the most transmitters in the least time. "So they run?" he asked, and I replied, "About a third will be running and the rest will be walking or trotting."

"Then it's a race," he declared, "and any

race in a park requires a permit, period." I hadn't seen any such mandate on the application form. On the other hand, this form gave the staff lots of latitude. It stated that "County Property Permits will coordinate review of your application package and advise you of additional fees, surety deposit, and other items required for permit issuance." Good grief, there might even be more surprises lurking!

Taking on the bureaucracy

I decided to press the issue and asked to see the relevant written regulations for permits and fees. The parks manager agreed to send them to me, and within an hour, my fax machine ground out four pages of fine print and tables, obviously part of a much larger document. Yes, there was a fee schedule that included "5k and 10k runs," along with over two dozen other activities such as weddings, dog shows, dunk tanks, and pony rides. But there was no definition of what constitutes a run, and no mention that any competition requires a permit. If a

Continued on page 46

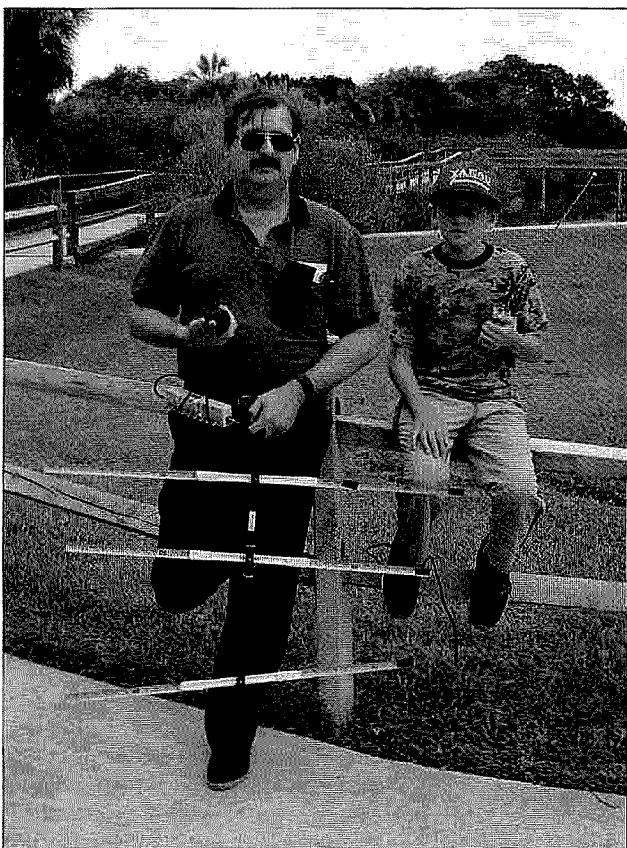


Photo C. Art Byrnes KA4WDK and his son A.J. found two foxes in about an hour and 15 minutes.

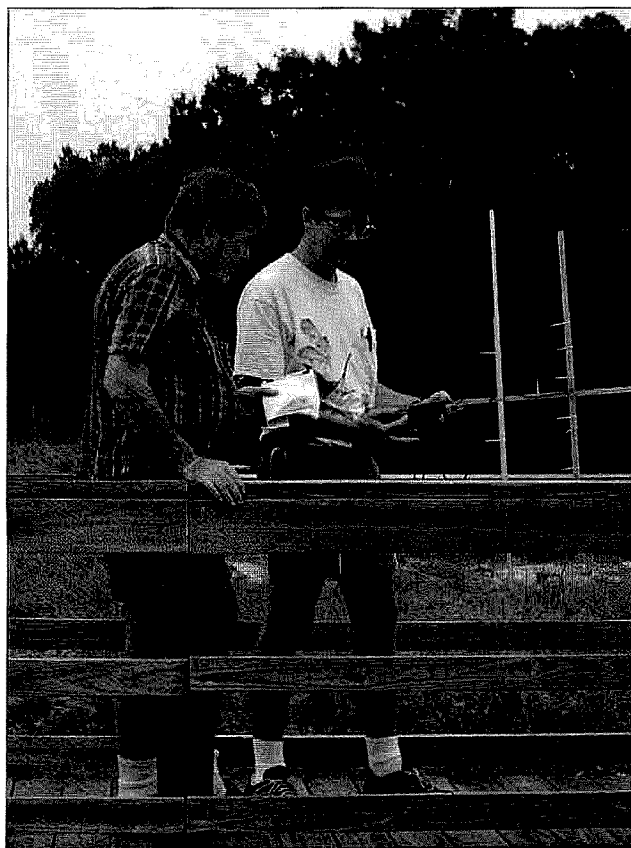


Photo D. Fred Villers K8FV and Steve Wyatt KO4YX teamed up to bag a couple of radio foxes.

HOMING IN

continued from page 45

couple of joggers decide to see who is fastest, do they need to file an application first?

The only paragraphs in the rules that indicated a threshold for requiring a permit were in the fee schedule, where the category of permit he circled as being applicable to me would be "using property for exclusive, personal, noncommercial use." The other two categories were for exclusive commercial or nonprofit use, with and without admission charge. In all three categories, the word "exclusive" was included.

Aha, that's it! The next day, I E-mailed the parks manager, the permit clerk supervisor, and the ranger. I pointed out that county regulations clearly state that permits are required only when a citizen or group wants exclusive use of a park or an area of a park, meaning to the exclusion of others. Certainly a permit would be necessary if an area of the park were to be cordoned off, or if streets or trails were to be blocked for exclusive use of the participants in a race. But for our radio-orienteeing, there will be no exclusive use of the trails. We will not be blocking off anything. In other words, we will be mixing in and not taking over.

With that as evidence, my E-mail restated

my belief that I would not be violating any county rules/regulations by holding this practice session without a permit. I declared my intent to proceed unless I received a letter of prohibition explaining clearly why it would be unlawful for me to do so.

Did it work? Actually, I don't know yet. The event is still a few days away and I haven't received a definitive ruling. I'm hoping that I'll get an OK and the session will go on as planned, because civil disobedience is out of the question. If the ranger tells me in advance that he'll enforce a bureaucrat's prohibition, I'll cancel. Then my next call will be to my elected county supervisor's office. I want him to tell me if the permit office exceeded its authority by its broad interpretation of the meaning of "exclusive," or if that interpretation actually represents the wishes of the Board of Supervisors.

You may be wondering, "Why not just get the permit?" Indeed there have been occasions where I have done so, such as foxhunting events at ARRL conventions and the West Coast VHF/UHF Conference when we needed to reserve a section of a park for a big group and the sponsor had insurance. But if the law doesn't require it, there is no good reason to pay a fee and take out insurance every month or two so a dozen hams

can informally run the trails in a park, mixing in with lots of joggers who are running the same trails at no charge.

If I were to find a way to demonstrate insurance and take out the permit now, I would be setting a precedent for any time that someone wants to do some ARDF in an Orange County park, no matter how informally. I'll tell you the outcome of this tussle in a future column. If you want to know sooner, check the "Homing In" Web site to see if there are results of radio-orienteeing at Peters Canyon Park on July 19, 2003.

Watch for the snakes!

Lots of other individuals and clubs are

training for the USA Championships and promoting radiosports as I write. John Munsey KB3GK, a frequent contributor to "Homing In," sent a CD of photos from the first international-rules on-foot foxhunt in Daytona Beach, FL, held on June 21, 2003.

"The park is 200 acres of woodland, water, swamp and scrub growth," he wrote. "Much of it cannot be penetrated by humans, not even transmitter hunters. There are various trails throughout the area, but none of the foxes were on or very near a trail. This area is populated by Florida wildlife, including alligators, snakes, lizards, and ticks, with swamp and open water. Every hunter was offered bug spray and bottled water before the hunt."

KB3GK put on the hunt, along with Bill Thomas KE4HIX. "Five transmitters were planned, but #2 arrived with a dead battery," he reported. "Then #4 failed to turn on remotely. When Bill went out to turn it on manually, he was spotted by one of the hunters."

To be fair, that fox was pulled out also. The loss of two did not prove to be a problem, as the remaining three provided plenty of challenge.

"Everyone agreed it was a really tough landscape to cover," John continued. "Daytona hunters are among the best at mobile hunting, but long-distance on-foot hunting is new and the learning curve was steeper than some expected. Several had recently built their equipment and as expected, there were small bugs to be worked out."

"One hunter discovered that his handie-talkie had a bad BNC connector so he decided to use a scanner with an active attenuator for hunting. But the scanner did not perform well and could not hear most of the transmitters. Others had minor problems such as needing a short length of coax, an adapter, or attenuator to complete the setup."

"For the past two weeks there had been rain every day, sometimes up to an inch. The predicted odds of rain for the hunt date were 70%, but dry weather held until just after the cookout that followed the hunt. Then about three-fourths of an inch fell in the next hour as hunters drove home."

"There was only one close call with wildlife. Pat Eckenrode AC4QM reported that he almost stepped on a snake of about four inches diameter. Pat reported that he did not stay long enough to determine other details. Other hunters who saw Pat leaving that

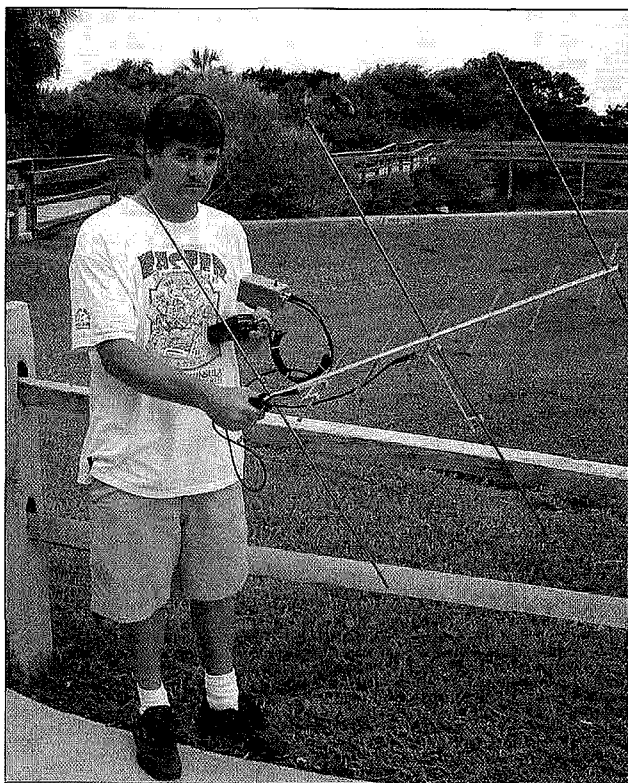


Photo E. Pat Eckenrode AC4QM had a bad day with equipment failure plus an encounter with a snake. Don't worry, it will be better next time!

Why Operate Portable?

In today's world everything is getting more portable. The room-size computer has given way to the desktop, to the laptop, to the PDA. As a mobile society we want to take everything with us, and radios are no exception.

Not only does it seem like everyone has a cell phone, but it also seems like everyone is constantly using theirs. In some ways it could be argued that amateur radio operators have gone from the forefront of the world of electronics to somewhere behind the leaders. While this might hurt our collective pride, it is not totally unexpected. Any group tends to make progress, hit a plateau, and then start to progress again.

I think one of the reasons that we haven't seen a lot of growth in the field of portable and mobile communications is because we've been focusing on the digital communications world. After learning to crawl with RTTY, we began to walk with packet radio, which gave way to APRS, PSK31, and most recently the marriage of radio and the Internet with IRLP. Developing these modes required a lot of time in the shack hunched over the keyboard. Although I like digital modes, I do like to see continued growth in mobile and portable communications, especially with regard to how they could be useful in an emergency. Let's take a look at some of the changes that have impacted nonfixed communications in the past.

Only a few years ago a ham had to post a copy of his license in a clearly visible location at the station. The station license with its call letters was assigned to the station and the operator license was assigned to the amateur radio operator. This was based on the fact that when ham radio started, a station was a fixed entity, normally large and bulky. There were exceptions, of course, such as stations on ships. The stations were equally large but they were mobile even if they did require that a structure be built on the deck of the ship to house the radio station.

For many years the requirements of a ham radio operator continued to reflect the fixed

station. The law required that the operator maintain a log of all operations. Hams were required to sign their call letters followed by "mobile" or "portable" to designate when operating away from their home location. Callsigns reflected the region in which your station existed and if you moved your callsign was changed to reflect your new region. When operating portable or mobile you were required to indicate the region from which you were operating, such as "KE8YN Mobile 7."

A lot has changed over the past 20 to 30 years as ham radio has gone from a primarily fixed service to a more mobile one. I suspect that if you counted up all the radios in use today, handheld and mobile radios would far outnumber the traditional fixed stations. I use 8 radios on a regular basis. At the house I have an HF rig, a dual-band 2-meter 440 MHz rig, and another 2-meter running APRS. In the car I have HF and a dual-band 2-meter/440 MHz, and I have three handie-talkies that get used regularly. I, like everyone else, tend to gravitate toward the nonfixed equipment for much of my operating opportunities.

The phenomenon has several key pieces. Today people are far more mobile than they were 30 years ago, whether they want to be or not. We tend to move from place to place for career or family reasons on a regular basis. Whereas once people went to work for a company and continued with that employer for their entire career, today people change employers 6 to 10 times during a career and may even change career fields several times. Commutes are longer, so we spend more time in our cars, and air travel is a regular part of many career fields. Naturally there are more opportunities to enjoy our hobby on the road or out of the ham shack than ever before.

In any case, as we've gotten more mobile,

the regulations governing our operating practices have been loosened. Like the chicken and the egg, it's not important as to which one came first. Although I tend to concentrate on how mobile or portable operations can contribute to support for emergencies or disaster situations, let's take a look at some of the ways that nonfixed operations can just be fun.

Sometimes we think in terms of a fairly exotic setup for mobile or portable operations, but it is not necessary to cash in your 401(k) to embark upon a nonfixed operation. Over the past few columns I've written about setting up a mobile station, using an Alinco DX-70T and ATOC Iron Horse antennas. For the next few months I'm going to look at portable operations with an eye to the business traveler or vacationer.

In an ideal world, a portable rig would be small enough to fit in a corner of your suitcase, including power supply and antenna. It would be powerful enough for DX operations but won't interfere with a television hooked to a poor cable connection — so it would be useful in a hotel room. It would run your favorite mode on your favorite band and the antenna would be minuscule. This is exactly why VHF and UHF are so popular. A handie-talkie fits, voice is a mode almost all hams like to use, power requirements are low, and the antenna is short. Likewise, with most of the country enjoying good repeater coverage, band conditions are not an issue and a traveling ham can expect to be able to hit a repeater from almost anywhere.

Unfortunately, 2 meters and above have become so commonplace that a lot of the excitement and enjoyment has dropped out. Local hams don't monitor the repeater as often and travelers may leave the HT in the

Continued on page 50

AOR Introduces Digital HF Format

AOR USA has introduced the ARD9800, a digital modem unit that could bring a "universal" digital voice format to the HF bands. AOR developed the product and format over the past few years, in an effort to bring the advantages of digital voice and communications to the HF bands.

"The ARD9800 represents both a great advance in communications and an opportunity for Amateur Radio operators to enjoy the advantages of digital communications no matter what brand of radio they may own," said Takashi "Taka" Nakayama KW6I, Executive Vice President of AOR USA. "The advantages offered by the ARD9800 are many, including 'near FM'-quality audio and the likelihood that the digital format can operate at lower signal levels than those of analog SSB, which is important as we approach the solar minimum."

The ARD9800 is a small, modem-size unit that requires only two connections to an existing transceiver, one through the radio's microphone input port, the other from the rig's "speaker out" jack to the ARD9800's audio input port. No modifications to the radio are necessary and the full analog capabilities of the transceiver are maintained. The owner may use the microphone provided with the ARD9800 or wire his mic to work through the ARD9800.

"The ARD9800 was demonstrated at the recent Dayton Hamvention and again at the large Amateur Radio convention in Friedrichshafen, Germany, and enthusiasm for the product was very strong," said Mr. Nakayama. "The most asked question was, 'When will it be available?'" Hams at both gatherings were amazed at the audio quality, often saying they had no idea such audio quality was possible using SSB on the HF bands.

The ARD9800 uses the open G4GUO digital protocol, a complex digital format that incorporates elements of phase shifting to transmit the digital signal. The digital tones have been engineered to fit within the normal voice audio passband, making it possible to use unmodified, existing radios for the digital format. The format uses forward error correction (FEC), making unlinked communications possible with two or more participants. "A brief header is sent at the beginning of each transmission, followed by the digital data," explained Mr. Nakayama.

Operators with ARD9800 units will not have to place their units in the digital mode to receive digital signals. The unit will automatically detect the digital format, decode it, and pass it to the self-contained speaker or to an external speaker. "This allows operators to listen for both conventional analog signals, as well as for digital," explained Mr. Nakayama. "It lets operators take advantage of the best of both worlds." To transmit in digital mode, the operator simply moves a switch on the ARD9800 front panel. Setting the switch back in the analog mode allows "normal" use of the transceiver.

The ARD9800 is easy to install and operate. No complex connections or adjustments are required. The owner simply solders a connector to a mic input cable that matches the mic inputs for his particular brand of radio. The ARD9800 is then connected to the mic input, the speaker output and to a 12 VDC power source.

AOR engineers designed some allowance for frequency error on the HF bands so that the operator does not have to be "exactly

on frequency." The ARD9800 will tolerate plus or minus 125 Hz in Digital/SSB communications mode.

The ARD9800 can also be used in other modes, such as AM or FM. Users of those formats will also notice improved audio quality; however, AOR cautions against using the digital format in mobile FM operations, as the vehicle's motion could cause "picket fencing" that may result in the loss of data and a dropout of the digital signal. Also, some repeaters may not key up quickly enough to allow the passing of the digital "header" needed to establish the decoding of the digital signal. Mr. Nakayama points out that the best advantages of the ARD9800 become apparent on HF in the SSB mode: "The audio is amazingly clear."

In addition to voice communications, with an optional memory board, the ARD9800 can also be used to transfer still images and even computer files. The ARD9800 has composite video input and output ports; it sends an image similar in speed to SSTV, but many believe the image is of a higher quality than conventional SSTV. The composite video ports allow the use of many common devices such as video and digital cameras along with conventional NTSC monitors and storage devices, such as VCRs or DVD recorders.

The unit also has a computer connection port, along with a provided serial connection cable, to allow controlling parameters of the ARD9800 and to facilitate the transfer of files over the air, if desired.

Included with the ARD9800 is the modem unit, a microphone, power cable for connection to 12 VDC, computer connection cable, and a conventional 8-pin round mic input connector. (Note that the ARD9800 does NOT need to be connected to a computer in order to operate.)

Options include a power cube, the memory expansion board, and custom-made cables that fit the microphone input ports of a variety of popular transceivers.

"We are often asked if digital HF communications are legal," said Mr. Nakayama. "The ARD9800 uses an open, published protocol (G4GUO), in conformity with FCC rules. In that way, it is no different from several other digital modes already in use, such as RTTY, AMTOR, etc."

Along those same lines, the ARD9800 has no provision for encryption of its data. (In the near future, AOR will introduce a commercial version of the unit for use by authorized commercial entities on their respective bands, that may support encryption.)

Mr. Nakayama added, "The big advantages we see in the ARD9800 are that it can be used right away, provides superb audio, works with every transceiver, is not a format that users of only one brand of radio can use, and adds great capabilities to operators, while it takes nothing away from what they already have. We think we've achieved a win-win product that could be as exciting a development today as SSB was nearly 50 years ago. AOR is very proud to present this product to Amateur Radio operators around the world."

AOR is a manufacturer of high-quality receivers, reception antennas, lab equipment and station accessories, headquartered in Tokyo, Japan, with North American distribution headquarters in Torrance, California. The MSRP for the ARD9800 is \$549 USD. Dealers are free to set their own prices and often discount from the MSRP.



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West Mountain Radio de N1ZZ and K1UHF

18 Sheehan Avenue, Norwalk, CT 06854 (203) 853 8080

ON THE GO

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briefcase. If there are stormy conditions and the local television announces a watch or a warning, most of us quickly grab the HT and the repeater directory to see what SkyWarn is tracking. However, there's a lot less general chatting than there once was.

Ten meters can be worked with a small rig and a relatively short antenna. There is a lot of voice activity on both upper side-band and FM. Like VHF and UHF there are many repeaters, and these open operations up on a worldwide basis. It's always fun to hit a repeater and hear a DX station into the same repeater. While ten meters is good for operating during daylight hours, it is pretty muted after sunset. Twenty meters offers some opportunities throughout the day and into the evening, but you have to compete with the "big guns" and the antenna becomes significantly longer.

There are several interesting rigs that offer multiple bands and multiple modes, but that can be operated easily as a portable. They were designed from the ground up to be a portable rig with carrying cases and whip antennas. These are a premium solution to the question of portable operations but might not be affordable for all hams.

Finally, there is one answer that may represent a good option and is based upon our earliest days as a hobby. Long ago, when ham radio was new, Morse code was a popular choice because it was a mode that was affordable and practical. The average ham could construct a working transceiver within his or her budget and get on the air. He or she could work the world with such a modest system. Although most of us prefer to use a microphone or a keyboard for much of our ham radio adventures, CW still presents some opportunities for portable operations. The rigs have migrated from a tuna tin to the metal Altoids box, but such rigs are small and inexpensive, and can be run from a battery or a "wall wart" transformer. While I'm not a die-hard CW fan, it is one

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Field Day 2003

Field Day is one of the most popular on-the-air contests/activities in amateur radio. It is held each year on the fourth weekend in June. The event is sponsored by the American Radio Relay League (ARRL) as an emergency preparedness exercise. During the 24-hour period, U.S. and Canadian participants strive to make as many contacts as possible operating in remote locations from tents, campers, vehicles, or just a simple setup in the middle of a field.

The ARRL Field Day rules consider the amateur satellites as a separate band and provide a 100-point bonus for the first satellite contact. The Radio Amateur Satellite Corporation (AMSAT) version of the event considers each satellite as a separate band, encourages international participation, and has additional rules for digital communications. Many Field Day groups have made efforts to put more emphasis on their satellite stations, both for ARRL points and to simultaneously make contacts in the AMSAT competition.

Field Day 2003 via satellite

Field Day via satellite in 2003 was excellent, and more “civilized” than some previous years. The recent loss of several satellites, including RS-12/13 to a solar flare last summer, Fuji-OSCAR-20 (FO-20) to a

low-voltage controller during nighttime passes, and UO-22 to an unknown age-related degradation, left some large holes in the normal around-the-clock coverage of amateur satellites. The only amateur satellite usable in the middle of the night in North America was FO-29. Stations around the world (AMSAT Field Day Rules — [<http://www.amsat.org>]) vied for voice, CW, and digital contacts using the current amateur-radio satellites.

Jerry K5OE and Ron AG5RS went for a modest operation on the far-west side of Houston, focusing on AMSAT-OSCAR-40 operation using the L-band (23 cm) uplink and S-band (13 cm) downlink. The American Radio Relay League (ARRL) classification for their activity was 1B, for a single transmitter and no more than two operators. They used Jerry’s call, K5OE. I was in West Point NY, attending a wedding, and listening

wistfully to UoSat-OSCAR-14 on my HT. I could hear contacts, but five watts to a whip antenna wasn’t enough for QSOs during this hectic weekend.

The AO-40 antenna at K5OE was a commercial-surplus, five-foot dish with a dual-band, circularly-polarized home-brew feed. Power output from the Kenwood TS-2000 and borrowed amplifier on L-band was 28 watts. For the low-Earth-orbit hamsats Jerry and Ron used a small dual-band yagi designed for 70 cm and two meters. A fiberglass, air-conditioned “Scamp” trailer was employed for the operating position. It was much better than the steamy tent of 2002, but there was no room for observers. The Scamp is really small, but it’s also easy to air condition. It gets really hot in south Texas over the Field Day weekend.

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Photo A. A five-foot dish, dual-band yagi, 10-meter vertical, and a Scamp do it all for K5OE and AG5RS during Field Day 2003. (K5OE photo)

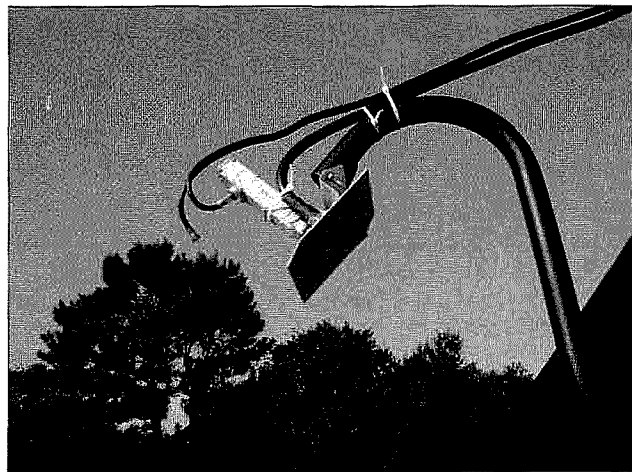


Photo B. An elegant dual-band, circular-patch feed system provides L-band uplink and S-band downlink for AO-40 operation during Field Day 2003 at K5OE. (K5OE photo)



Photo C. Jerry K5OE checks the computer for the next satellite pass while "QØZMO" looks on. (AG5RS photo)

HAMSATS

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It's a given that there will always be a serious glitch at the beginning of Field Day. A last-minute connector problem almost created a panic, but was quickly cured shortly after the beginning of the event. On the first International Space Station (ISS) pass, Ron AG5RS got a contact with

astronaut Ed Lu on his first call. This was Ron's first-ever ISS QSO. Ed asked about Houston weather and was having a great conversation with Ron. Jerry had to bring Ron back to Earth with a nudge or two since there were likely dozens, if not hundreds, of stations hoping for an ISS QSO.

With this early success out of the way, Jerry took over the station and moved on to

AO-40. Contacts were brisk. AO-40 was "visible" to hams in North America right at the start of the contest and had crowded conditions for the first several hours. As the afternoon wore on and the "squint" (the angle of the satellite's antennas pointing to Earth) degraded, signals became scarcer, and four hours into the contest all but the hardiest CW operators had moved on to other satellites. Many contacts with Asia, mostly JAs (Japan), were made on Saturday afternoon. AO-40 returned in

the early hours of Sunday with a five- to six-hour window of prime operating parameters for North America. Europe was in the window for much of Sunday morning, including stations in France, Germany, Italy, Spain, and the UK giving out DX contacts. By 1700 UTC, though, the squint situation was bad enough that only a few CW signals were heard, mostly on the west coast of the U.S.

FO-29 provided some excellent contacts for Jerry and Ron on several passes. Many stations found this satellite as a good source of points in the contest. AMRAD-OSCAR-27 (AO-27) and Saudi-OSCAR-50 (SO-50) were good for relatively easy FM contacts. UoSAT-OSCAR-14 (UO-14) was another story. Using 100 watts to the 7-element beam, just one contact was made via UO-14. Only the extremely lucky, high-power stations had success. Bruce KK5DO showed up on a deep-south orbit and gave Jerry and Ron a contact before the rest of the U.S. was in the satellite's footprint. AMSAT rules specify that only one contact is counted for each FM-voice hamsat.

The biggest disappointment for 2003 was the lack of easy digital satellites. UO-22 and the Korean KitSats were missed. Nav-OSCAR-44 (NO-44 or PCSat) was not in range for Saturday activity, and was almost out of range of South Texas when it was finally activated on Sunday morning. While Jerry and Ron were ready for some digital operations, they were out of luck this year.

What's in store for 2004? We'll just have to wait and see. Echo from AMSAT may be in orbit in time for Field Day next year, and there are other satellites waiting for launch to keep things interesting.

AO-40 birthday bash

Beginning September 16, 2003, 0000 UTC and ending November 17, 2003, 0000 UTC, AMSAT is sponsoring a bash to celebrate AO-40's 3rd birthday. SSB, CW, and digital modes are acceptable for this event. The AO-40 Command Team requests that CW and Digital operations be performed with minimal power (QRP suggested) to keep transponder loading to a minimum.

All hams worldwide are welcome to participate. Awards will be given out for top scores worldwide, stateside, non-stateside, and AMSAT-NA member (with paid up dues). Runners up in each of the above categories will also receive an award. It is possible for one person to get one or more of the awards due to location and score.



Photo D. Ron AG5RS demonstrates the high-tech rotator system on the dual-band yagi (2 meters and 70 cm) during Field Day 2003. (K5OE photo)

The exchange for the bash is callsign, grid square, and AMSAT-NA membership number, or year and month of birth (YYMM) for non-AMSAT-NA members.

Everyone is encouraged to participate and submit a score. E-mail logs will be accepted. All logs must be received by Bruce Paige KK5DO on or before November 30, 2003. If you are not participating in the bash, please send your log as a check log.

Logs from logging programs should be in Cabrillo format or exported in ASCII with the same fields as the paper logs, but may be in the order that the logging program exports them (e.g., SSB might be logged as USB/LSB by the logging program or Grid might be exported before AMSAT #/birthday).

Those participating in the bash are encouraged to submit a weekly total by category so that we can have a running history of activity. These scores will be posted without callsigns so as not to give away who has what score. Please submit the weekly score to [kk5do@amsat.org].

Exchange example:

K5OE de KK5DO

KK5DO de K5OE EL29 12345

K5OE de KK5DO EL29 L3456 (L is used to indicate Life Member)

Or if K5OE were not a member, K5OE EL29 5511

Scoring:

AMSAT-NA Life Member QSO - SSB = 3 points, CW/Digital = 6 points

AMSAT-NA Member QSO - SSB = 2 points, CW/Digital = 4 points

non AMSAT-NA ham QSO - SSB = 1 point, CW/Digital = 2 points

Paper log format:

Date (YYYY/MM/DD), Time (UTC), Callsign, Grid Square, AMSAT # or birthday (YYMM), SSB/CW, Point Value

2003/10/16, 1400, KK5DO, EL29, L34567, SSB, 3

2003/10/17, 0100, K5OE, EL29, 12345, CW, 4

2003/10/17, 0105, XX1XX, EL01, 5509, USB, 1

Postal submissions address:

Bruce Paige KK5DO

PO Box 310

Alief TX 77411

trimming or lengthening may be needed. After you have it working correctly, you might consider using epoxy glue or electrical tape to secure the wires to the hangers. Solder all connections at the center insulator and use silicone sealer or electrical tape to protect them from moisture.

You can suspend this antenna horizontally, vertically, or sloping. I found it very easy to support by sloping it between my tower and a small tree. I have worked several DX stations with good reports on all three bands using this antenna. It is a very good DX antenna when used in a vertical configuration. By using it as a sloping dipole, it seems to be much less susceptible to noise than when mounted vertically. Sloping it is the easiest way to suspend and provides best all-around performance. If you are more interested in local and stateside communication, horizontal mounting could possibly work better for you.

This method can be incorporated in the construction of antennas for three or four bands of any desired frequency. It doesn't necessarily have to be made for the WARC bands. It is fun and economical to build and makes a great conversation piece for your antenna farm or garden.

Simple Test Circuits

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in the forward voltage drop and resistance of the diodes. The bridge voltage can be varied with R3, to check the diode's linearity. This feature will allow a dynamic matching of the diodes over a varying current range.

Resistors R1 and R2 may be matched by simply using a digital ohmmeter and selecting two resistors of the same value. The exact resistance value doesn't really matter as long as they are the same.

Using the diode matcher is easy. Select a diode and connect it to either set of test terminals. Set R3 to about midposition and then connect a diode to the other terminals and check the difference voltage on the DVM. Keep trying diodes until the best match is found. To check tracking of the diode

pair, vary the applied bridge voltage by rotating R3 about 25% of rotation in both directions. A good matched pair of diodes will usually track within a few millivolts over this range.

The next most often used component we use in project circuitry is the transistor. Over the years, my junk box has become the home of dozens and dozens of orphaned three-lead semiconductors. The majority are either NPN or PNP transistors and the others could be just about anything that comes with three leads. Sorting out a good transistor for a project can be a real hassle sometimes, and our next project eases that chore.

A single 4093 quad 2-input NAND Schmitt trigger performs the active duty in the NPN/PNP transistor tester/sorter circuit. Gate "A" is connected in an astable low-frequency oscillator circuit producing a square-wave output. This output is inverted with gate "D" to supply power to the collector and base inputs of the test fixture. The oscillator's output is twice inverted with gates "B" and "C" to supply power to the emitter input test fixture. This arrangement provides an opposite polarity voltage between the base/emitter and emitter/collector test terminals during test.

Connect a good known NPN transistor to the test fixture and see how the circuit determines which LED will light. During the time gate "A"'s output is "low," the output at gate "D" is "high" and gate "C" is "low." This places a positive voltage at the collector and base test terminals, and a negative voltage at the emitter terminal. A good NPN transistor will be forward-biased and will conduct, lighting the red LED-1. Base current is supplied through S2 and R3 to the test fixture. Opening S2 will remove the base current, which will cause the LED to go dark. A leaking or shorted transistor can cause the LED to stay on or possibly only dim some when S2 is opened.

During the time that gate "A"'s output is "high," the voltages at the transistor's test fixture are of the opposite polarity for an NPN transistor to conduct and neither LED will light. The time that gate "A"'s output is

Just Hang 'er Up

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a little tricky. Adjust one band at a time, and then go back and check the SWR on the earlier tuned bands. More

"high" sets the test circuit voltages up to check PNP transistors. A good PNP transistor will light the green LED-2.

The output test results may be somewhat confusing if the transistor is connected to the test fixture incorrectly. However, for most devices no harm will come during testing. (NOTE: The maximum current will be about 5-7 mA through the device.) I've found the circuit also handy in determining the emitter, base, and collector leads on orphan transistors. Just remember that there are other three-legged semiconductors that are not transistors and cannot be tested with this circuit.

Hopefully one of these simple projects will get you digging into your junk box and building something fun and useful for the shack. 73

Test Time for the SG-2020 Transceiver

continued from page 38

back to your CQ, you had great audio, a really clean signal, but my S-meter didn't move! I had to find out what you were using and what kind of antenna you had." Our exchanges included my QRO level and the fact that the 2020 was feeding my antenna "patch" a B&W wideband dipole at 30 feet facing N/S. So maybe I didn't need the compressor after all. Similar reports of strong, clear, and clean audio are the norm no matter what power level or frequency I operate on, and even with a marginal vertical antenna. I get out, and reports are that my signal has "punch." For more information about "punch," refer to the sidebar that accompanies this review.

• Electronic Keyer: I'm not the biggest CW buff, and I was put off with only Mode B iambic being available. Which leaves me with two choices: (1) use a straight key, or (2) learn to live with iambic Mode B. Not too tough a choice.

Summary:

The SG-2020 may not be everyone's idea of a perfect rig, but for dependability, portability, and a miserly approach to battery consumption, it fits my bill 100%.

I do have some pet gripes about the rig having used it for nearly a year. The first is the antenna "doggie" — anything that hangs free can and at some time will fail. The manual, which is sorely in need of an update, describes the antenna connector as a rear-panel-mounted SO-239 connector, which I wish it still had. My second — actually, if you count the manual, my third — gripe has to do with the Sta-cons or quick-disconnect power connectors. I'd rather have accepted (with reluctance) a doggie with a Molex or, better yet, the new "standard" PowerPole connectors, but this is a matter of preference. And far be it from me to question those folks at SGC for making these decisions.

The ADSP (original) was good, but the new updated ADSP2 is great! I've found that with a bit of fiddling I can get a 20-meter signal so quiet that you'd think the rig had FM capabilities. It's an option; the SG-2020 is available without ADSP, but for around a hundred dollars, why skimp? The rig with ADSP2 is less than \$800, and according to their Web site will be shipped free in the US. I did order two options, the underpriced mobile mount and the three-year extended warranty, which I feel is well worth the approximately total \$150 it adds to the price. The 2020 is built like a tank, and obviously will be around for many years at our shack and on vacations.

In my infrequent contacts with the factory, I have found them helpful and knowledgeable about my equipment, as well as being ready to answer those dumb questions we all have but are usually afraid to ask. Even if a SG-2020 isn't in the works for you now, I'd suggest that you visit their Web site, [www.sgeworld.com], and check out the rich library of information available for download. These are the same folks who make those antenna couplers, one of which resides in my van. Another came as a special when my SG-2020 was ordered and is in the house waiting for use.

If you want a quality, rugged portable HF rig, the SG-2020 is a gas to use, and delivers what they promise. If it were any more fun to use, someone somewhere would find a way to make it illegal! 73

Study Guides That Pass the Test

continued from page 41

Hathaway; American Technical Society, 1940.

17. *Principles of Radio* (fifth edition) by Henney; John Wiley, 1945.

18. *Fundamentals of Radio* by Jordan, et al.; Everitt, ed.; Prentice-Hall, 1955.

19. *Modern Practical Radio and Television* (in three volumes) by Quarrington; Caxton Publication Co, Ltd.; 1950.

20. *Fundamentals of Radio* by F.E. Terman; McGraw-Hill, 1938.

21. *Basic Radio* (second edition, in six volumes) by Marvin Tepper; Hayden Book Co., 1973; ISBN 0-8104-5921-3.

22. *Practical Radio Communication* (second edition) by Nilson and Hornung; McGraw-Hill, 1943.

23. *Practical Radio Servicing* by Marcus and Levy; McGraw-Hill, 1955.

24. *Old-Time Radios! Restoration and Repair* By Carr; McGraw-Hill, 1991; ISBN 0-8306-3342-1.

25. *Antique Radio Restoration Guide* (second edition) by Johnson; Krause, 1992; ISBN 0-87069-638-6.

26. *Resonance and Alignment* by Rider; John F. Rider Publisher, Inc., 1936.

27. *The How and Why of Radio Apparatus* by Secore; 1922; Reprint Lindsay Publication from 1993; ISBN 1-55918-113-3. 73

HOMING IN

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patch of woods reported that he was on a dead run."

Family help

I hope your club has tried international-rules foxhunting at least once and is planning to do it again. But even if there is no club nearby, you can get training with just a little assistance. Larry Benko WØQE does it by playing radio hide-and-seek with his young daughter at a local park.

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Fruit Bits

Three morsels from W7RXV's extensive platter — or would that be "patter"?

Shortly after we graduated from high school, our parents were off on another trip courtesy of Uncle Sam. So we, my older brother Hal W7SCR and I, got to watch the house and the dog. Now, the dog had grown up around radio, electronics, and ham radio. You could hide a speaker in one room and call him on it. He always went to you, not the speaker. You couldn't fool him. However, one time I think we got to him.

Corporal — he was an Air Force dog — LOVED to ride in the car — *any* car! Rattle your keys, and he was at the door before you were. One day, Hal and I went for a drive. The dog headed for Hal's station wagon. We turned on the 75m mobiles and the conversion went something like this:

"W7SCR mobile, W7RXV mobile, how copy Hal?"

"Fine business."

"W7SCR mobile, W7RXV mobile, here Corporal, here boy, come on, let's go for a ride. Over."

"W7RXV mobile, W7SCR mobile," Hal was laughing, and I could hear the dog barking since he was just up the road a couple of car lengths in front of me. I could see him running frantically back and forth from the front to the back of the station wagon, sniffing, looking, and barking. Corporal never did figure out how we did that one.

Due to technical difficulties beyond our immediate control ...

More often than we liked, the transmitter would drop out at the low budget radio station where I was chief engineer. One afternoon while I was in the control room, the transmitter dumped. With rapid-fire words, I told

the announcer to inform the listeners that we would be back on the air as soon as we fixed the transmitter. Instinctively, he reached for his mic switch and just started to say something when he got a funny look on his face as it clicked with him.

Remotely controlled

My wife once called me at work to tell me that she had gotten a real buy on a new fan and light with remote control for the living room. She would let me install it when I got home. Oh, boy, which wall do we want the switches on? How do you mount that wire mold on the wall? I found it a pleasant surprise to discover that the remote control was a wireless system. Just do a balancing act on a ladder to install the fan, the light kit, and the remote control receiver, then enjoy it.

A few days later when I got home from work, two of our grade-school-age grandchildren were there for a short visit. I started to tell them that they could set the fan and the light as they wished and that it would work from any room in the house, when they interrupted with, "Oh, it works just fine from across the street, Grandpa."

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Are Your Batteries Corroding?

Don't let it eat away at you.

With homeland security in the forefront of our consciousness today, we have been urged to be prepared with flashlights, portable radios, etc. Most of us use batteries in our handie-talkies and pretty much know how to keep them charged. We are generally aware when those batteries will no longer hold a charge and at that time we replace them. But what about those other batteries in our flashlights, tape recorders, smoke detectors, portable radios, test equipment, and alkaline battery packs as backup to HT nicads or nickel-metal-hydride batteries?

Many of us have heeded the recommendations and have obtained the above emergency items and put batteries in them. There used to be a battery company that advertised that their batteries would not leak, but if they did, the battery company would replace your flashlight at no charge; I have not seen or heard this ad in years. In my experience, over time, batteries leak and corrode, whether used or not.

I recently wanted to use a tape recorder to tape a talk, but when I pressed the play button on the recorder, nothing happened. Upon opening the battery case, I found that the batteries had corroded. Since alkaline batteries are chemically a base, using a mild acid can neutralize the corrosion. Most of us have clear vinegar in the kitchen. Vinegar chemically is acidic acid, which is an ideal mild acid. It is very safe to use.

I first removed the battery cells from the holder, and then, dipping a Q-tip into a small bowl of vinegar, I swabbed the contacts with the vinegar. Immediately, when the vinegar touched the corrosion, bubbles started to form: the acid was neutralizing the base.

When the bubbles stopped, I noticed that there was still some corrosion left, I again applied more vinegar and the bubbling started again. After repeating the process a number of times, no bubbles were seen when applying fresh vinegar, so I dried the contacts with paper towel and to ensure I had removed all the moisture, I used a hair dryer on low setting to blow-dry any remaining moisture.

The battery contacts were now corrosion free, but the plating of some of the contacts was uneven due to the effects of the corrosion. I then used a fine file to clean up the contacts, inserted new alkaline cells, and the tape recorder played as good as new.

When I finished taping the talk, I removed the batteries because I did not know when I'd need to use the recorder again. I then started thinking about where else I was using batteries. I realized that I use batteries in many places: smoke detectors, cameras, thermostats (for the time clock), flashlights, portable radios, and some test equipment. When I checked the 9-volt batteries in the smoke detectors, most of them read above 8.8 volts and still powered the sounder with a

loud volume when I pushed the test button. In spite of that good performance, I replaced those batteries, as older batteries tend to be the ones that corrode first.

Many older hams will still have a VTVM (vacuum tube volt meter) sitting on the shelf. Even though those were designed to operate off 120 VAC (house power), the Ohms circuit uses a 1.5-volt battery. I have seen VTVM batteries corrode if not changed on a regular basis.

Many of the new antenna analyzers are designed to operate from either a wall-wart (AC transformer) or from internal batteries. If you have an MFJ-259 or similar analyzer that you use only occasionally, remove the batteries & place them in a zip-lock type bag so that if they do corrode, your equipment will not be damaged.

If you are a holiday/birthday party shutterbug, your camera probably sits for months without being used in between occasions. It's best to remove the battery from the camera while storing the camera.

Batteries with some service life remaining in them can be used in devices that you use on a daily basis. Depending

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on your lifestyle, that may include a bedside flashlight or a Walkman-type CD/MP3 player that you listen to while exercising several times per week. The point is that when you are using a battery in active service, you will know when one or more cells go bad by decreased performance of the device. The light in the flashlight will not be as bright; the volume of the CD player will not be as loud, etc. This will give you the clue to check and replace the batteries, which generally will be before corrosion damage occurs.

HOMING IN

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"She hides my low-power lightweight transmitter," he wrote. "Then she calls me on my cell phone so I know when to start. Each hunt is usually less than a quarter mile in distance, but I never see her while I'm hunting. When I find the transmitter, she appears out of the bushes, takes the transmitter, hides it again, and calls me three or four minutes later. We repeat this a dozen times or so and then I buy her a treat on the way home."

Larry's practice system is particularly useful if you're testing out a new piece of RDF gear and need some short hunts. For a multiple-transmitter experience, get together with a few fellow hams, pass out the transmitters, and have each one head in a different direction. When each participant has placed a fox, the hunt is on.

How is transmitter hunting developing in your home town? Your photos and stories are welcome. Send them by E-mail or postal mail to the addresses at the beginning of this article.

Notes

1. The championships will be over by the time you read this. "Homing In" will feature a complete report in an upcoming issue.

ON THE GO

continued from page 50

more tool to use and for portable operations it just might work out well.

Why operate portable? It can add enjoyment to a vacation. It can take the edge off being out of town for business, and it can

certainly give you something to do while the XYL visits with her family. It can be a just-for-fun aspect of our wonderful hobby.

Are you a traveler who operates portable while on the road? Let's hear from the road warriors, RV owners, and others who take a rig along either on a regular basis, or on special occasions. What are your experiences? What has proven to be fun for you? Drop me a line and let me know.

Q&H

Continued from page 7

S&H green stamps or Texas Gold Stamps?
Mimeograph paper or mimeograph machines?
Telephone numbers that began with a word (e.g., Oxford)?
Metal ice trays with levers?

Did You Know That ... ?

The plastic things on shoelaces are aglets?
The first owner of the Marlboro company died of lung cancer?

All U.S. presidents wore glasses?

Debra Winger was the voice of E.T.?

Pearls will melt in vinegar?

The three most valuable brand names are: Marlboro, Coca Cola, and Budweiser, in that order?

Thanks to The Modulator, April 2003.

NEVER SAY DIE

continued from page 9

those events took a good deal of planning, the coincidence of one following the other by just a few weeks is almost enough to get a few people thinking.

Worse, the growing number of unexplained (a.k.a. covered-up) anomalies around the 9/11 attack have triggered a growing number of conspiracy sites, many raising legitimate questions. Like? Try [questionsquestions.net]; [911-strike.com]; [unansweredquestions.org]; [whatreallyhappened.com]; [copvicia.com]; [truth-now.com]; [ratical.org/ratville/CAH]; [cooperativeresearch.org]; [americanfree press.net]; [communitycurrency.org/9-11.html]; [thewarofreedom.com]; [911pi.com]; [tenc.net]; [onlinejournal.com].

The *New Yorker* readers had the benefit of a well-researched article by Peter Boyer pinning down the anthrax used in the October 2001 attack as being American-developed. And then silence descended.

If you've read *Into The Buzzsaw* you are aware of the super cover-up of the Flight 800 crash, plus a bunch of other

cover-ups which reporters have been prevented from airing or publishing.

Then came *You Are Being Lied To*, a big, fat book packed with exposés of cover-ups. Their latest, *Everything You Know Is Wrong* has even more exposés of cover-ups ... like Libya being involved with the Flight 103 crash. It was Iran.

So, is the silence about the anthrax scare better than the usual lies?

Hey, they're still lying about the Moon landings, the Roswell crash, the Oklahoma City bomb, UFOs, and on down the list.

QRP?

A letter from Randy Jackson WB6ZFG suggests that I turn 73 into a QRP magazine. Well, I'm not ready for anything quite that radical, but I sure would like to see more QRP articles being submitted. Choke me on them.

How about reviews of QRP equipment? Reports on QRP symposiums? News of any upcoming QRP events? "My most exciting QRP adventure" articles? QRP DXpeditions?

Randy, being Randy, suggests I publish pictures of attractive females using QRP. Sex sells almost anything, so I'm game to help promote QRP with it. Let's get those hormones flowing.

This fits right in with our need to get every licensed ham active with QRP as part of our Homeland Security cooperative plan. Get 'em on the air. Get 'em organized. A yearly Field Day? How about a QRP Field Day every month? How's the last Saturday of every month hit you? Is there a QRP club that might be interested in handling the contest details?

UNICOR

A letter from a federal prison inmate explained that he works two shifts a day for a company called UNICOR. He explains, "This is a totally federally owned private corporation (sounds illegal, doesn't it?). At every federal prison be it high, medium, low, or camp, there is a factory that produces everything from furniture to the electrical harnesses for F-16 fighter aircraft. My job is Head Quality Assurance Inmate and Production Coordinator. It sounds very prestigious, but the truth of the matter is that whenever there is any problem it always falls on my lap. I have always worked all my life and this factory has made me develop considerable people skills. Not everyone is an interested worker. My salary is the highest, plus I have longevities and the advantage of working overtime. I work two shifts, the first from 7:30 a.m. to 3:45 p.m. and the

second from 4:00 p.m. to 10:30 p.m. Last month I made \$708, but of this half is taken automatically for payment of restitution and fines. My position would be one of at least \$100,000 per year, and I assure you that I could justify that amount simply with the improvements made. Well, many people do not understand that this is a business that the government is running. The 125,000 federal prisoners are backed by a 30 billion dollar budget, plus the revenue from UNICOR of approximately \$600 million last year. We supply all of the government agencies."

In checking UNICOR on the Web I found that in addition to supplying federal agencies, they're also assisting "private firms to compete for government contracts by purchasing manufacturing time and to subcontract parts and services through UNICOR. Our high-quality, competitively priced labor can translate into more competitive bids and higher profits for your business."

Well, no wonder, with their paying Chinese labor prices, thus helping American companies to compete with foreign labor costs on government contracts.

Zoloff

This is the stuff, like Ritalin, Prozac, etc., that school authorities are forcing parents to give their children. So, I enjoyed reading an ad where the side effects are in about two-point type. The common ones are diarrhea, feeling tired, sleepy, having trouble sleeping, tremor, upset stomach, increased sweating, indigestion, and feeling agitated. For men and women there are sexual problems. Hey, that's a lot better than cutting the kids' sugar intake any day.

Silver

Reader Allen Wiegand says that when he had a sinus attack with sneezing and congestion he put a dropper full of silver colloid in each nostril. It stung a little and then the symptoms cleared up and were gone permanently. And when his dog was scratching his ears and shaking his head Allen put a dropper full of silver colloid in each ear once a day for a couple days. It cleared up the problem.

At around a penny a gallon to make this stuff it's well worth having around. Check out my \$37 AC-powered kit.

Begging Our Neighbors

Oh, we talk a great line about free markets, but we're lying. Take the \$200 billion farm bill, supported by both the

Continued on page 61

Scrambling News

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Propagation Expected to Improve

During the last quarter there has been a moderate surge in the solar indices, but we are well past the peak of Solar Cycle 23, so the upward trend is only temporary.

The rise in sunspot numbers means that the average 10.7 cm flux is likely to stay above 120 for the next month or two; therefore, the Time-Band-Country chart remains unchanged from last autumn. The 10.7 cm flux levels should drop to around 100 by the new year, however.

Solar behavior is expected to range from quiet to active this month, but propagation conditions should be in the Fair (F) range most of the time. Coronal holes and occasional M-class flares will tend to keep the geomagnetic field in flux, but you should be able to find workable DX paths at least two-thirds of the time. The worst periods are forecast to be the 1st-3rd, 13th-16th, and 28th-30th, with Coronal Mass Ejections (CMEs) and/or geomagnetic storms likely.

Geomagnetic storms have long been associated with the autumn and spring equinoxes. While the exact reason is unknown, a study of data collected over the last fifty years suggests that geomagnetic activity is indeed greater near these dates. Between 1940 and 1990, there were forty-two major magnetic storms close to the equinoxes (40% were in March or September), yet none occurred in the solstice months of June and December. Anecdotal evidence of auroral activity, recorded since ancient times, also supports the supposition that geomagnetic storms are more frequent around the first days of spring and fall.

To counterbalance this, the HF bands typically "peak" in the weeks surrounding the equinox, so excellent worldwide communications are possible as long as the sun isn't too turbulent. Although local ionization levels are greatest during summertime in the Northern Hemisphere, research has shown that the worldwide level of F2 ionization is actually up to 50% higher in the fall and

September 2003						
SUN	MON	TUE	WED	THU	FRI	SAT
	1 F-P	2 P	3 F-P	4 F	5 F-G	6 G
7 F-P	8 F	9 F	10 F-G	11 F	12 F	13 F-P
14 F	15 F-P	16 F-P	17 F-G	18 F-G	19 F-G	20 F
21 F	22 F-P	23 F-G	24 G	25 F-P	26 G	27 F-G
28 F-P	29 F-P	30 P				

EASTERN UNITED STATES TO:												
Country	15/17	17/20	17/20	17/20	17/20	15/17	15/17	10/12	10/12	10/12	17/20	10/12
Central America	15/17	17/20	20	30/40	30/40			10/12			12/15	12/15
South America	30/40	30/40	17/20	17/20				10/12	10/12	12/15	17/20	17/20
Western Europe	20/30	40	20/30	20/30				10/12	10/12	12/15	12/15	12/15
South Africa	17/20	30/40	40/50	40/50	30/40			15/17	10/12	15/17	15/17	17/20
Eastern Europe	20	20	20					10/12	10/17	15/17	15/20	
Middle East	17/20	17/20						15/17				
India/Pakistan	10/12		17/20				17/20	17/20			15/17	10/12
Far East Japan	15/17	17/20	17/20				17/20	15/17	10/12			15/17
Southeast Asia	10/12	17/20	20	20	20	30/40	30/40	17/20				10/12
Australia	10/12		20									15/17
Alaska	10/12	12/15	17/20	17/20	20/30	20/30	17/20	17/20				10/12
Hawaii	20/30	20/30	20/30	30/40	30/40			10/12	10/12	10/12	15/17	17/20
CENTRAL UNITED STATES TO:												
Country	15/17	15/17	17/20	17/20	20/30			10/12	15/17	10/12	10/12	10/12
Central America	15/17	15/17	20/30	20/30	17/20			10/12			10/12	12/15
South America								12/15	12/15	12/15	17/20	17/20
Western Europe			17/20	17/20				12/15	12/15	15/17	17/20	
South Africa								12/15	12/15	17/20	17/20	
Eastern Europe	30/40	30/40	30/40					12/15	12/15	17/20	17/20	
Middle East	20	20						15/17	15/17	15/17		
India/Pakistan	15/17	17/20						12/15	12/15			
Far East Japan	10/12	12/15	17/20	17/20	17/20		17/20	17/20				10/12
Southeast Asia	10/12		15/20	17/20				10/12	10/12			
Australia	10/12	15/17	15/17	17/20	20/30	30/40	17/20				12/15	10/12
Alaska	10/12	12/15	17/20	17/20	20		17/20	17/20				10/12
Hawaii	12/15	15/17	15/17	17/20	17/20	20/30	30/40	17/20		10/12	12/15	12/15
WESTERN UNITED STATES TO:												
Country	10/12	12/15	15/17	17/20	30/40				10/12	10/12	10/12	12/15
Central America	10/12	12/15	15/17	17/20	17/20						10/12	10/12
South America	17/20							17/20	17/20	20	20	20
Western Europe	17/20	20		20								
South Africa	17/20	17/20										
Eastern Europe	20											
Middle East		15/17	17/20						12/15	15/17		
India/Pakistan	10/12	10/12	12/15	17/20	17/20	17/20			17/20			15/17
Far East Japan	10/12	10/12						17/20	15/17	17/20		
Southeast Asia	10/12	12/15	15/17	15/17	17/20	17/20	17/20					
Australia	10/12	10/12	12/15	15/17	17/20	17/20	17/20	17/20	17/20			15/17
Alaska	10/12	10/12	12/15	15/17	20/30	20/30	30/40		12/15	10/12		
Hawaii	20/30	20/30	30/40	30/40	30/40			10/12	12/15	12/15	15/17	17/20

Table 1. Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.

spring. There is also less of a potential for over-ionization, so the overall effect is a global improvement in propagation conditions. This seasonal boost is generally limited to the lower bands, however, because September is statistically the peak hurricane month and tropical storms often saturate the upper bands with noise. Fifteen and 20 meters typically benefit most from the "equinox effect," but 10 meters can also provide some strong DX opportunities, especially on north-south paths.

73 and good hunting!

Band-by-Band Forecast

10–12 meters. Conditions will improve throughout the month, and by October most parts of the world should be workable. Look for contacts to the east in the morning hours and to the west in the afternoon. Southeastern through southwesterly paths will be better than those near the auroral zone, but be sure to check the morning and evening gray-line paths over the poles. Daytime short-skip will normally be somewhere between 1,000 and 2,000 miles.

15–17 meters. Signal strengths will continue to improve as the month passes and long-path propagation should be particularly good. The best openings will still be to Central and South America, especially from early afternoon through mid-evening, but also look for opportunities in Asia and the Far East. Expect skip distances up to 2,300 miles on Good (G) days, but the average will usually be from 1,000 to 2,000 miles.

20 meters. "Twenty" will be your mainstay as usual and can be worked around the clock, but nighttime will be best. Try long-path propagation across the Antarctic into Asia and the Far East and short-path propagation to Australia, Indonesia, and the South Pacific. Short-skip could be as limited as 500 miles during the day, but will normally be from 1,000 up to 2,200 miles at night.

30–40 meters. Hurricane season will make life difficult here, but during the quieter periods there should be some solid DXing opportunities. Central and South America will be your mainstays, of course, but Eastern Europe, Africa, and the Middle East could provide some interesting variety, especially for those east of the Rocky Mountains. Skip will vary between 800 and 2,000 miles at night, but expect only 600 to 800 miles during the day.

80–160 meters. Check these bands when 40 meters is active. Tropical activity will severely curtail activity here, but nocturnal

thunderstorms will no longer be as much of a problem as they were during the summer months. Look for peaks just after midnight and again just before sunrise, a situation that pleases both night owls and early risers. Short-skip will normally vary between 900 and 2,000 miles.

NEVER SAY DIE

continued from page 59

Dems and Reps, and quickly signed into law by Bush. This raised the level of agricultural subsidies by over 80%, thus encouraging farmers to grow more, increasing our exports and depressing world food prices. This reduces the farm incomes in the developing countries. Three-quarters of the bonanza go to the biggest and richest 10% of the farmers. The rich get richer again, and at the expense of poor farmers here and around the world.

And never mind the growing federal deficit which is driving down the dollar's value.

Oh, did you hear about the imposition of steel tariffs? So much for trade liberalization and promoting development in the world's poorest countries.

Worried Sick

Yes, the things you worry about can make you sick. Okay, so you haven't read Barbara Levine's *Your Body Believes Every Word You Say*. She proves it ... over and over.

If you keep saying that you have a poor memory, guess what? If you say you're "sick to death" of something, you just may find you are. Your body doesn't understand it's just a figure of speech, so it tries to follow instructions.

Ten years ago a study showed that women who believed they were prone to heart disease were four times as likely to die as women who didn't.

Just as if you wish for something the universe will often follow through for you, what you say or think about yourself will often become fact. Watch your language.

You can bring about major changes in your body just by being positive. Read the magic formula on page 42 of my *Secret Guide to Health* for the details.

Water!

Are you drinking 8–10 glasses of distilled water every day? Probably not, since 75% of Americans are dehydrated. To get the full story read the Batman's book, *Your Body's Many Cries for Water*. When you feel like a snack, you're

thirsty. If you get tired during the day, you're thirsty. Water can ease back and joint pain. Even a small drop in body water hurts short-term memory and ability to do math.

Even five glasses of water a day can cut your chances of getting colon cancer by 45%, breast cancer by 80%, and bladder cancer by 50%.

Please don't drink that stuff from your tap. You don't want any chlorine, fluorides, or any of the other crapola in it. Check [www.steamdistiller.com] for an inexpensive still.

Light

It's been a while since I've nagged you about getting out in the sun every day. I was reminded by a clipping from Ken Glanzer about Dr. Ott developing arthritis. He went to Florida and soaked up the sun for a month, with no improvement. Then suddenly it was gone. He'd sat on his dark glasses and broken them. Read his book *Health and Light* which is reviewed in my *Secret Guide to Wisdom*.

We need those UVs in our eyes if we're going to be healthy. We should be using full-spectrum lighting at home and our offices. It makes a world of difference in schools. No, UVs don't get through our windows or glasses.

The Enron Pikers

American Industry has a lot to learn from our government. The mere fiddling of a few billion dollars by accountants is chicken feed compared to the massive amounts our beloved Congress has been keeping "off the books."

Like? Well there's about \$50 billion for the International Monetary Fund that you won't find mentioned in the federal budget. Then there's almost \$4 trillion (with a T) for government-sponsored enterprises (GSEs) that are kept off the balance sheet. Oh, there's Social Security, where the revenues go into the Treasury and the liability for payments is off the books, replaced by unreported IOUs.

The real biggie is the numbers you'll only find if you are able to get your hands on the *Comprehensive Annual Fund Reports* (CAFRs) for our cities, counties, states, and the feds. These show that there's over \$60 trillion off the books, which is mostly invested in the stock market.

The pre-tax personal income of everyone in the US runs around \$6.5 trillion, so our government has been stealing from us and cooking the books way beyond big time.

So, what can we do about all this lying and stealing? Is it hopeless? Dammit,

no! Join the Green Team and swear to never again vote for any incumbent. NRA = Never Re-elect Anyone! Get the politicians out of your state legislatures and Congress. Never elect a lawyer either. Look for business people who have been successful and would like to step in for one term and help get our country away from the corporations and banks that own it and make this a republic again, just as the founding fathers planned.

Breast Feeding

Still more proof of the importance of breast feeding children for you to pass along to your granddaughters or great granddaughters if they're with child. A large Danish study reported in the *JAMA* showed that the longer a child is exclusively breast fed, up to at least nine months, the higher the child's IQ. It has to do the special nutrients in the milk on the baby's developing brain.

Back when I had a bunch of employees I encouraged mothers with babies to keep them with them at work and exclusively breast feed them.

Ozone Good

In a study conducted over a 15-year period, women who worked at home had a 54% higher death rate from cancer than women who worked away from home. How come? It's the daily exposure to household products. Like? Out-gassing from carpets, upholstery, drapes, plywood, particleboard, wallpaper, and cleaning supplies. Plus radon gas.

Exposure to these chemicals, most of which were unknown in the home a hundred years ago, has been causing headaches, memory loss, fatigue, drowsiness, dizziness, eye and skin irritation, depression, cancer, shortness of breath, and so on. And yes, of course we're bringing our children up in this poisonous atmosphere.

The solution? Simple, get a small ozone generator. That'll get rid of the bad stuff in no time.

Oops! ... The Return of Talking Plants

Here, in its entirety, is the "Talking Plants" item that last month we neglected to continue from July. Sorry about that!

The American Society of Dowsers quarterly digest had a fascinating reprint of a chapter from a book by Keith Varnum. I'll have to get it and read the whole book.

This had to do with him going to work for Michio Kushi, where he was responsible for a garden about half the size of a

football field, where the food was grown for Kushi's East-West Institute in Los Angeles. This was a huge garden to water, fertilize, and weed.

When he complained about the enormity of the task Michio explained, "You know, you don't really have to weed the fields. You can talk to the spirit of the weeds and ask them to grow in balance and harmony with the vegetables."

That's crazy, he thought ... but since everything else Michio he'd tried had worked, what the heck. So he began talking aloud to the weeds, asking them to grow in harmony with the vegetables. Then he also talked to the vegetables, urging them to grow tall and in harmony with their weed neighbors.

After a few weeks he began to see a change. The weeds grew, but not enough to harm the vegetables. Then he started hearing voices in his head. It took him a while to get used to this. They kept telling him that they didn't need fertilizer or water, just his love and company.

So he tried it, even though it hadn't rained for months and the soil was sandy and devoid of nutritional minerals. They explained that he'd have to keep the lack of water a secret from the Institute residents because their belief in the need for water would kill them. So he went to the fields, lay in a hammock and talked to the plants, keeping the illusion alive that he was out there watering and fertilizing the plants.

The plants suggested that he hide the monthly water bill so they wouldn't notice the sharp drop in consumption.

Then they suggested that he plant a separate small garden just for the pests such as snails, bugs, aphids, rabbits, mold, fungi, and deer. When he did this the big garden was no longer bothered and the small special garden was ravaged by every pest there was. The big garden produced record crops.

Michio somehow knew what was going on and smiled.

Our ability to communicate with plants is backed up with Chris Bird's *The Secret Life of Plants* and his *Secrets of the Soil*, both reviewed in my *Secret Guide to Wisdom*. All life is connected, if only we'd take off our mental blinders.

Job Losses

During the 1990s factories were being moved from the cities to small towns, where land and labor was cheaper, putting over 300,000 urban workers on unemployment. Then, as the value of the dollar rose, making imports less expensive, companies started moving their factories from the small towns to lower land and wage countries such as Mexico and China ... with almost

600,000 workers in rural communities losing their jobs, most in the last two years.

American manufacturing jobs have fallen from 35% of the workforce in the 1950s to about 10% now.

With the increasing loss of blue collar jobs there's more and more need for better educated workers ... and our schools are not providing them. We are living in a high-tech world. We're in a world where technologies are radically changing every few years and our educational system, geared to the needs of 1850, has left us woefully unprepared to cope with today's business demands.

Our educational system, and our people, have to come to terms with the world of 2003. The old paradigm of going to school, graduating, finding a job, working for 40 or so years and retiring with a gold watch and a pension are a rapidly fading memory.

When Wal-Mart moves in dozens of local mom and pop stores disappear ... unable to compete on either price or merchandise variety.

Our kids need an educational system that is geared to the realities of the 21st century, not the 19th. We need to get the feds out of the school business. Good grief, didn't we learn anything about the socialist central planning system being a total failure in every country it's been tried? It takes business competition to keep up with the world's changing needs, not well insulated from reality bureaucrats in Washington.

So what's a worker to do? Wake the hell up to reality circa 2003, turn off the TV and make an effort to educate yourself so you'll have some alternatives when the ax falls on your neck. The concept of life long learning is beginning to gradually seep in. As technology advances, we either keep up with it or become superfluous (out of work). Supplying technology updating courses (programs) is going to be a fast-growing industry.

Knowledge is portable. Going to classes? That's 19th-century teaching. Listening to lectures? Har-de-har. Not when information can be delivered via DVD or video tape anywhere in the world from anywhere in the world. A professor at a blackboard? Hey, we have the world of computer graphics and interactive programs now.

Ignorance doesn't cut it. So, how many of the books I've reviewed in my *Secret Guide to Wisdom* have you read so far?

My own sthick is to get people to think in terms of starting their own businesses. Maybe start something with the time that is normally wasted watching

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some serious lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). \$15 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. You'll have plenty of fascinating stuff to talk about on the air. \$5 (#02)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Travel Diaries: You can travel amazingly inexpensively - once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow

in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000? Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. \$0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moonoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

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Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 100 Editorial Essays: \$5 (#72)
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My 1992 We The People Declare War! On Our Lousy Government book - 360 pages and packed with ideas that'll get you all excited. Was \$13. While they last \$10. Just a few left, found in the warehouse. Last chance for this classic. (#06)

Stuff I didn't write, but you need:
NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$30 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, etc. \$30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$25 (#92)

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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost) — comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the November 2003 classified ad section is September 10, 2003.

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NEVER SAY DIE

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ball games or other TV brain-free trivia intended to keep you sitting on the couch, a brewsky in one hand. Like Judge Judy, Texas Justice, sitcoms, quiz, reality shows and so on.

With 300 million potential customers out there, isn't there something you can sell 'em? You don't even have to advertise in magazines or newspapers much anymore, now that we have the Internet.

Crime Deterrent

The Brits tested a bunch of their juvenile prisoners, with one group getting nutritional supplements and the other getting placebos. The improvement in behavior was huge, with the violent offenses committed later dropping by 40% with the supplemented group compared to the placebo-fed group.

That's sure an inexpensive way to cut down on crime.

Do you think there's any way we might be able to get mothers to feed their children nutritional diets? Okay. I'm a hopeless idealist.

Long ago I used to go horseback riding with a young girl whose mother fed her breakfasts of white toast, grape jelly, and coffee. This poor soul had long bouts of depression, lying in bed crying for days, and thinking about suicide. When she got married she fed her daughter similar crapola, so her daughter was a mess, too.